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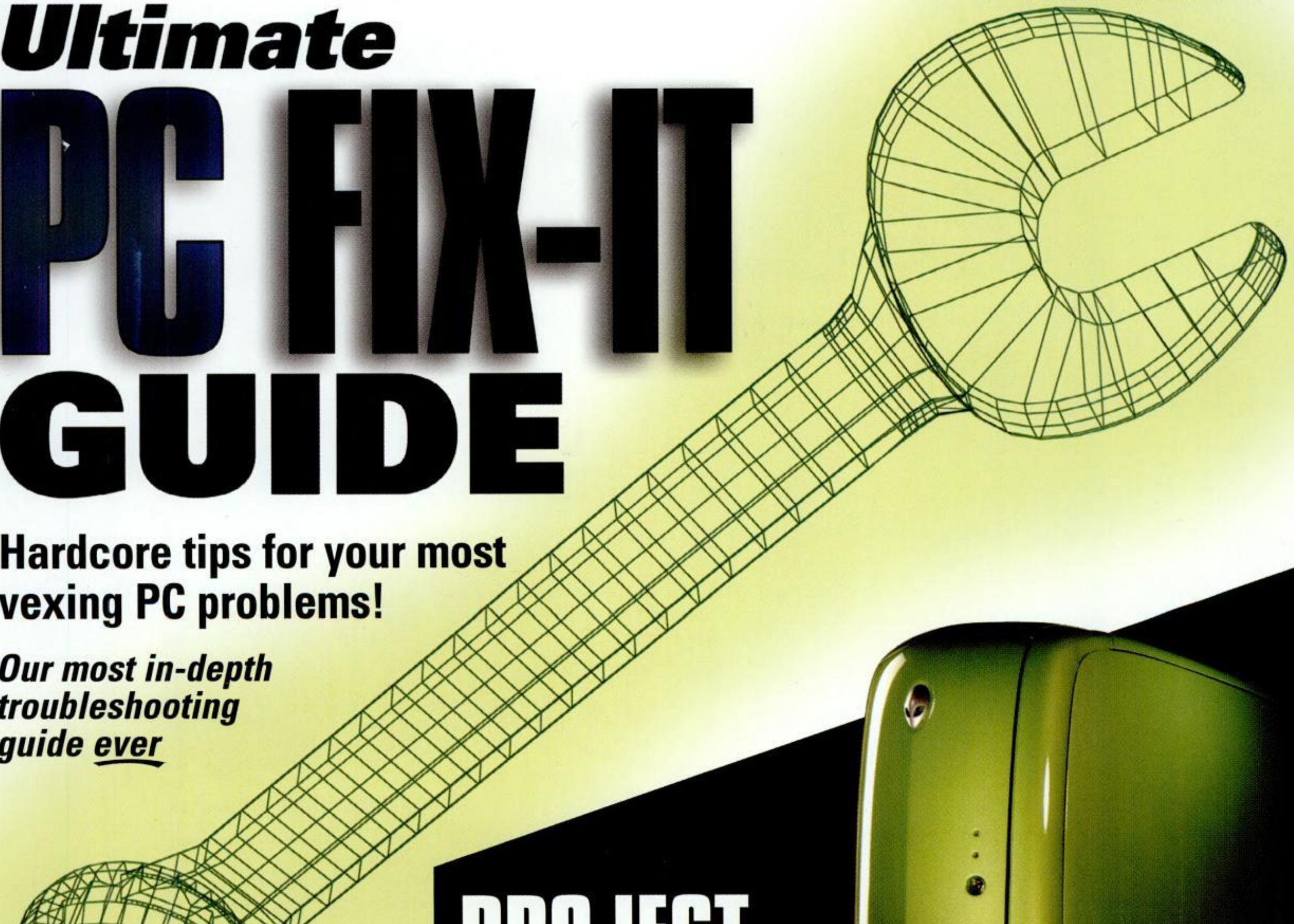

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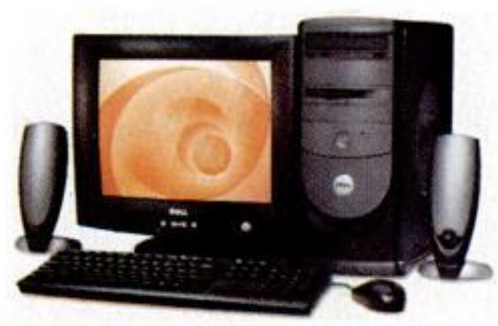

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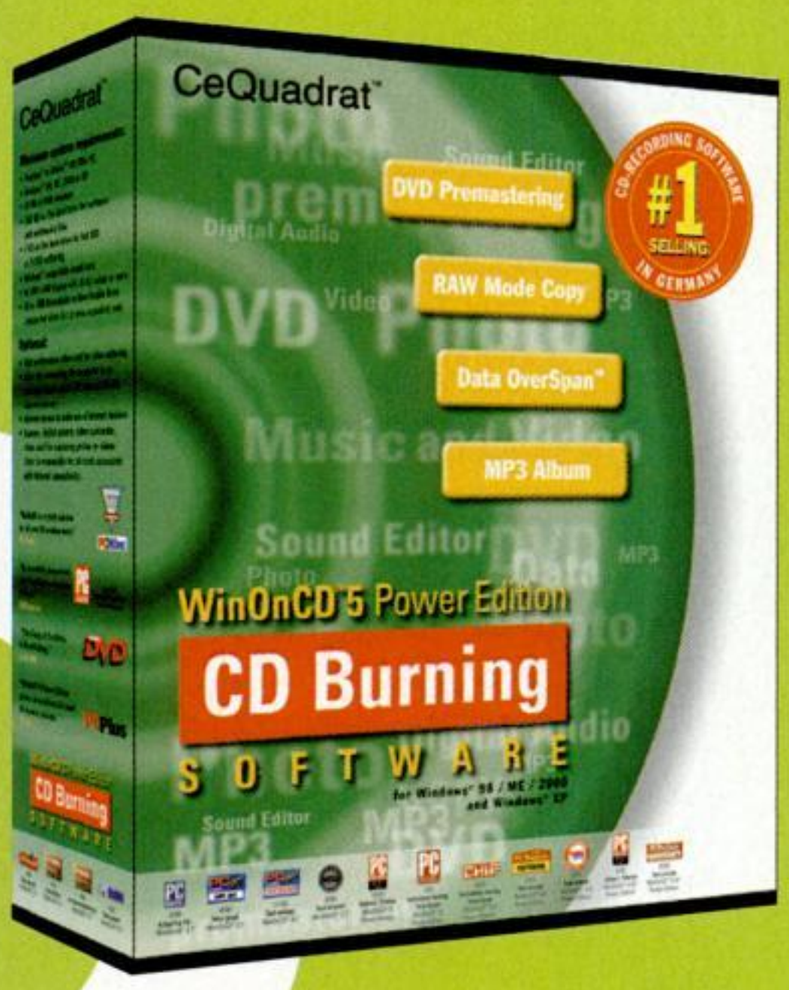

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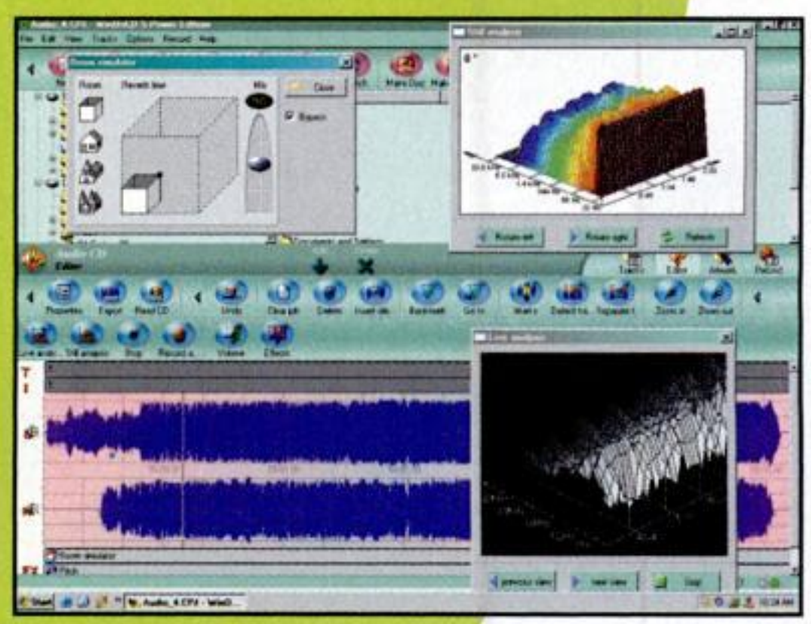
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Release Notes

The Unfair Smear

Against Pre-Fab PCs

Let's face it: The "dream PC as sports car" analogy only goes so far. Sure, a highly tuned PC brimming with power can be as captivating and awe-inspiring as a highly tuned automobile, but the origins of these PCs and their automotive counterparts can be as different as night and day.

In the world of cars, we covet Porsches and Bimmers. Camaros and Mustangs. Even Hondas and Subarus. See a thread here? All of these cars are OEM marquees!

I don't know about you, but when I see the latest Ferrari, I don't say to myself, "Hah! I wouldn't be caught dead in that pre-fabricated piece of corporate compromises." Instead, I admire the craftsmanship, the styling, and all the power and handling that Ferrari engineered at the factory. I also feel the same way about my much, much, *much* less expensive sports coupe, and I bet a lot of other PC enthusiasts covet their own "pre-fab automobiles" with unconditional love as well.

Why, then, do so many hardcore PC fanatics absolutely despise factory-built computers?!

Let's think about it for a moment: A lot of hardcore car nuts might add aftermarket performance parts to their rides, but they still enjoy a positive emotional connection to the OEM marquees that manufactured their cars. But not a lot of hardcore PC enthusiasts gush over "the latest showroom models from Dell, HP, and Gateway." And to this day, a lot of *Maximum PC* readers still diss us for giving high scores to machines from big computer manufacturers. These readers believe that a large OEM is simply incapable of getting it right.

Much of the anti-OEM sentiment is residue from the old days when pre-fab PCs really were crap. I'll start with just two words: "Packard" and "Bell." We also suffered a lot of proprietary madness. About four years ago, I tried to service my sister's 200MHz HP machine, and discovered a draconian knot of custom HP parts that defied easy access, let alone replacement. And, of course, when 3D acceleration hit the scene in the late 1990s, a lot of system OEMs were still shipping onboard S3 Virge chips—as if these wafer-thin silicon mints could even accelerate 2D side-scrollers.

But it's now 2003, and times have changed. Today's best OEM rigs are well-built, contain very few proprietary parts, and boast the fastest subsystems available. Some are even overclocked at the factory, so it's becoming harder and harder for home builders to claim a performance advantage. Factor in that OEM warranty, and you'll begin to wonder why anyone builds his or her own PC.

The answer, of course, is that building, accessorizing, and modding PCs is not only fun but affordable. Because all PC enthusiasts can freely compete with the big OEMs, some take it upon themselves to smear the OEMs. This is about competitive pride, not about actual quality differences.

I bet that if driveway mechanics could build supercars at home for $5,000, they'd be dissing Ferrari as well.

—JON PHILLIPS

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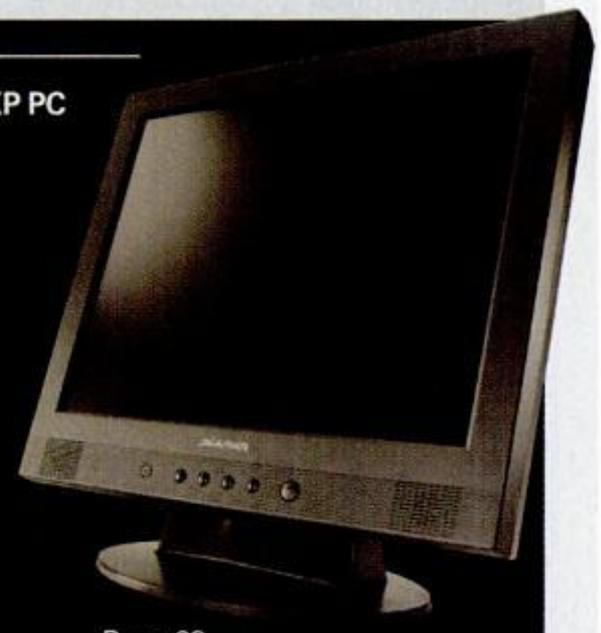

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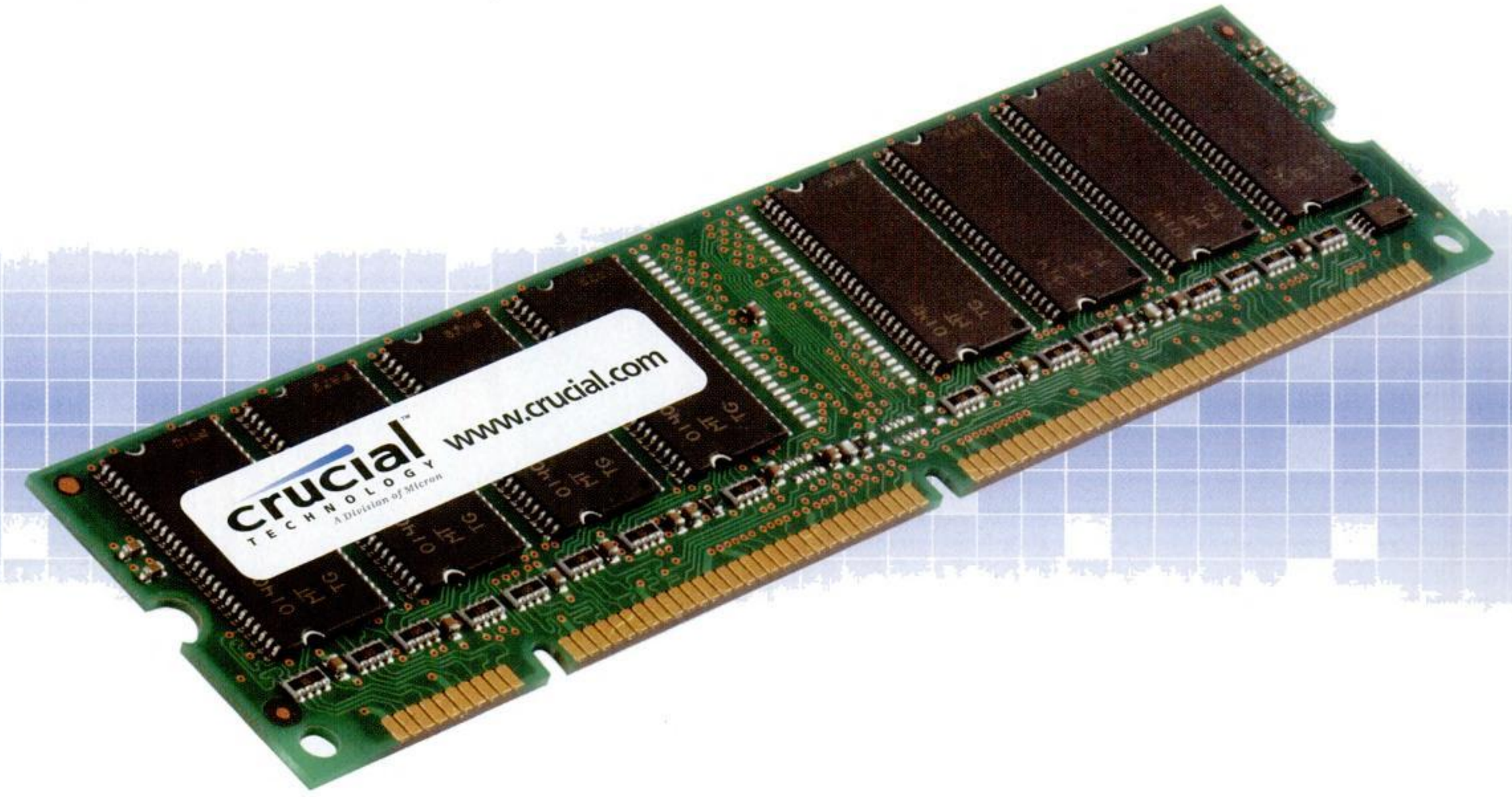

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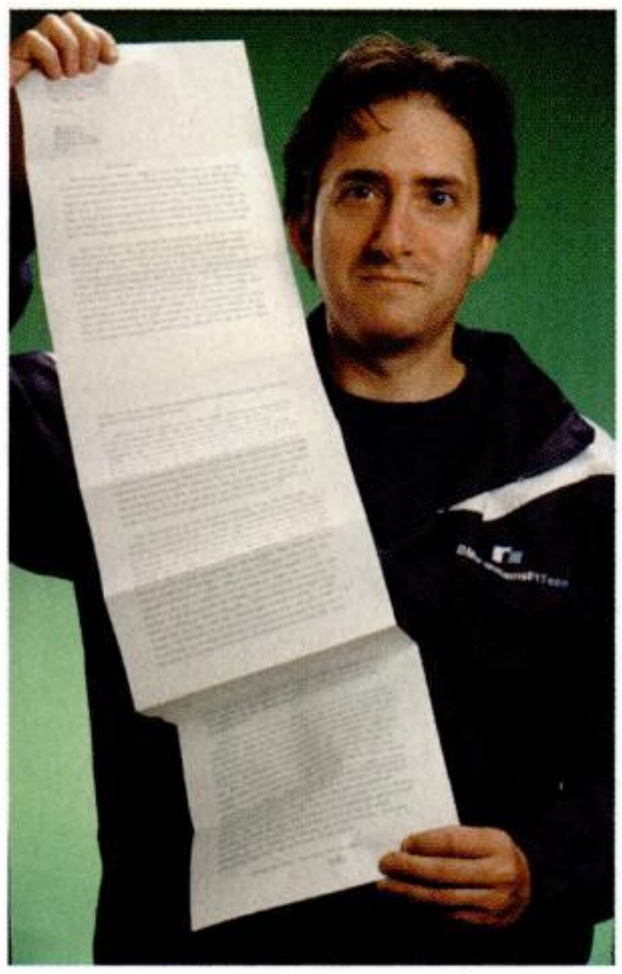

SOME PICTURES SAY MORE THAN A THOUSAND WORDS—WAY MORE

This month's award for Longest Snail Mail letter goes to Willi Wald, who opined on such diverse topics as poor industry-wide software documentation, the "crumbling foundation" of Windows XP, the demise of the hard reset button, and U.S. homeland security (Wald is Canadian).

Wald also asked us a number of interesting questions (e.g., "What kind of motor and power converter are used in a modern hard drive?"), but we were most intrigued by his closing comments: "My heroes are Tesla, Salk, Chomsky, Phil Zimmerman, the architects and builder of Linux, and most iconoclasts. I have no use for Roosevelt, the CIA, Edison, Big Business, any of the Bush-men, Gates, and other monopolists and 'copy protectors' of any stripe. Enough for today. Live long and prosper!"

Judging from his letter, Wald is one of our more learned, thoughtful, and eloquent readers. Just one problem: We throw out most snail mail letters without ever reading them, and we never, ever reply to them directly!

Please, readers, no more snail mail. If you don't have an Internet connection, go get one. We like reading your e-mail, and reply to at least 50 percent of all electronic correspondence. Just be aware that the shorter and more succinct your e-mail, the greater your chances of receiving a response.

DEALING WITH DELL

I loved your December 2002 article on upgrading laptops. As a college student with limited income, I too am trying to squeeze any extra life out of my Inspiron 8000. Dell's design seems relatively easy to work on. The problem is getting parts from Dell, which generally limits its end-user parts to cables and monitors. Even the parts you used in your article are no longer listed at the address you gave. It is much worse if you dare order something "exotic" like a new or replacement videocard. Dell generally makes good products, but its belief that end-users are simpletons ensures that, "Dude, I won't be getting another Dell."

"Dell generally makes good products, but its belief that end-users are simpletons ensures that, 'Dude, I won't be getting another Dell.'"

—MARK BROCK

DEALING WITH DELL, DEUX

After reading the notebook upgrading article [December 2002], there's one thing I would like to add: Dell users have been upgrading their videocards on the Inspiron 8x00/Latitude C8x0 series notebooks for a while.

The upgrades to GeForce4 440 cards on the i8000 model have had about a 50/50 success rate, mostly depending on which screen is installed on the laptop. The Radeon Mobility 7500 seems to rely on which LCD is being used, but seems to work with UXGA and some of the newer SXGA+ screens. As soon as more Radeon Mobility 9000s become available, I'm sure there will be more attempts by users to upgrade their C8x0/i8x00s.

One thing to remember: When calling Dell Spare Parts, give them only the part number you're ordering. Never mention which laptop it's for. If you do, the chance of getting the part diminishes. Sometimes you have to call multiple times before you get someone who will sell you a card.

—GENE MURY

TECHNICAL EDITOR WILL SMITH REPLIES: Wow, a 50 percent success rate, eh? We considered videocard upgrades for the Dell and Alienware laptops in our notebook upgrading feature, but decided not to lead readers down such a dubious path. We just can't recommend upgrades with such a low success rate, especially when failure can leave a laptop dead.

HYPER-THREADING HUBBUB

Just one day before the launch of Intel's fastest 3.06GHz Pentium 4, RiStaR has managed to turn on the Hyper-Threading function of the older Pentium 4 2.4B using the Iwill P4HT-S 845PE board. This proves that Hyper-Threading was already present in the Northwood, but that it had been disabled by the BIOS. There should be some way to enable Hyper-Threading in the BIOS even if the CPU is not a 3.06GHz P4.

Is this fact or fiction?

—ROLLAND BROWNING, SSGT, USAF

SENIOR EDITOR GORDON MAH UNG RESPONDS: Hyper-Threading, the technology that turns one physical CPU into two virtual CPUs, has actually been around for more than a year. Last year, Intel introduced it with the Xeon version of the Pentium 4, and the HT circuitry has likely been in all of the 0.13-micron "Northwoods" sold. Unfortunately, it's been switched off in the overwhelming majority of those CPUs—at the die level, according to our sources. Anyone who's had success getting HT to run in a P4 marked at slower than 3GHz most likely has an engineering sample. In some samples sent to PC OEMs and the press, HT was turned on.

We can't be certain, but we'll guess that hacking HT on a production P4 is about as easy as circumventing Intel's clock-locking. In other words, it ain't gonna happen.

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COMING NEXT MONTH

IN THE LAB-FABULOUS MARCH ISSUE OF MAXIMUM PC

SPEED TRIALS

We benchmark the living daylights out of a lab full of hardware to name the fastest PC technologies, once and for all. It's our ultimate hardware showdown! Quick, quicker, and quickest—the test results don't lie!

WINDOWS ERRORS: DECIPHERED AT LAST

Scott Mueller, the author of this month's "Fix-It Guide," shows you how to use tools already built into Windows to decipher a whole mess of annoying operating system problems. This story is the "software yin" to the "hardware yang" you'll find on page 22 of the issue you're now holding.

TWEAK YOUR TUBING: GORDO STYLE

We got so much praise for Dream Machine 2002's case wiring, we decided it was high time to show you how to do the same type of wiring job at home. Step into Uncle Gordon's Detailing Shop for a quick step-by-step tutorial.

PLUS: The best case mods in Texas, and another stunning cover babe!

KNIVES DON'T KILL PEOPLE, PEOPLE KILL PEOPLE

This is in regard to the November review of *Battlefield 1942*. Great review, but I would like to correct "Young Bill" on [what he describes as] the "useless knife." The knife is not useless, but in fact one of my favorite weapons. There is nothing sweeter than sneaking up on an enemy in a land-based machine gun mount, and gutting him with your knife. Oh no, shooting him in the back would be too noisy. Unsheathe that "useless knife" and do him in quietly.

In fact, even out in the open, one-on-one with the enemy, there's no need for that machine gun. Unsheathe that "useless knife," and strafe left to right. Dodge your enemy's fire (trust me, he will miss), and when he's out of bullets and reloading, come in at a good angle and give it to him good. There's nothing more satisfying than a clean kill without wasting precious bullets.

Keep up the good work, guys. Love this magazine!

—ERIC ABARCA

EDITOR-IN-CHIEF JON PHILLIPS REPLIES: So can we interpret this as a vote in favor of gun control? (Wink, wink.)

TO CLOSE TO CALL?

I was reading the December issue of *Maximum PC* and was almost dethroned over the review of the new Logitech Z-680 system. It must have been a misprint! If not, I suppose I can live with this. But the Klipsch still sound better, right?

—JAMES BOTHE

TECHNICAL EDITOR WILL SMITH REPLIES: The new Logitechs sound as good as the Klipsch ProMedia 5.1s, are cheaper, and have more features and a better control pod. The Logitechs may not be without problems, though. In the time since we published our review, we've heard reports of a noticeable hum from the rear channels. Our in-house review unit does not hum, but we have heard the humming speakers at some retail locations. Logitech has received some complaints, as well. In response, the company has posted a speaker FAQ at www.logitech.com.

Regardless, Klipsch isn't resting on its laurels. See page 36 for details.

FRICTION. IT MUST BE STOPPED!

I am deeply troubled by the picture of the NV30 included in the December issue of *Maximum PC*. While the photography is outstanding, the lack of caution when handling such a prize is disturbing, particularly during the cold winter months. Not only is Rachel not wearing a grounding strap, but she is wearing what appears to be a vinyl suit. Vinyl is one of the most ESD-dangerous fabrics one can wear while handling ESD-sensitive devices, and the static charge generated by friction with her outfit could damage the NV30 or needlessly shorten its useful life. Please reshoot the photo with Rachel not wearing the vinyl suit (in this case, the grounding strap might be optional).

—ERIC CHRISTENSEN

EDITOR-IN-CHIEF JON PHILLIPS REPLIES: Cheeky, very cheeky. Mr. Christensen identified himself as an electrical engineer in his letter, and he's absolutely right: We goofed. But his "safety instructions" bear all the telltale signs of a Playboy photographer.

And, no, Mr. Christensen, you may not...

CRACKING UP

I have one question that wasn't answered in November's Athlon XP article: With the new cores being a layer thicker and thus slightly taller, how much more likely am I to crack the core while installing the heatsink and fan compared with the old cores (which I understand were already quite fragile)?

—MIKE YOUNGBECK

SENIOR EDITOR GORDON MAH UNG RESPONDS: There's no reason to believe that the additional layers in the Athlon XP "B" will affect the rate of mishaps. In defense of the glass-jawed Athlon XPs, it's actually very easy to install and remove heatsinks without damaging the processors. People who do have problems are likely using the wrong tool for the job, using a poorly designed heatsink, or simply using bad technique. In case you were wondering, AMD won't offer extra protection for its chips until early 2003 when it introduces the Athlon 64, which will include an integrated heat spreader.

AMD FAN-MAN CRIES FOUL

You had better be ashamed of yourselves for selling your souls to Intel. You should have tested the 2.8GHz P4 with DDR because then there would be no, repeat *no*, one CPU having a speed advantage over

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the other because the tests would've been on a more level playing field. If you want to get your self-respect back, along with telling Intel to go to hell, do a rematch, this time with both the AMD 2800+ and P4 2.8GHz running DDR SDRAM.

—RICHARD LUDWIG

EDITOR-IN-CHIEF JON PHILLIPS REPLIES: Sometimes we read tidbits of fallacious reasoning that are so damn frightening, we feel like shutting down the magazine and becoming survivalists deep in the Sierras.

Let's get this straight, readers: We could have set up the Athlon XP vs. Pentium 4 tests in any number of ways—some testing scenarios favor the Athlon, some favor the P4, and none can offer a truly "level playing field" because the platform variables between the two processors are insurmountable. That's why we considered not just ultimate performance, but also processing efficiency and value, when we analyzed our benchmarks.

Sure, we could have run the P4 with DDR memory, but that would have made a mockery of the whole Lab experiment. Everyone knows that the P4 runs fastest when teamed with the fastest iteration of RDRAM. This is why not a single system vendor would ever dare send us a DDR P4 system for review.

As we stated in the article, our goal was to compare the fastest desktop Intel platform to the fastest desktop AMD platform. Teaming up the P4 with DDR would have somewhat removed memory performance from the equation—but just marginally so. Chipset, memory controller, and bus speed differences between the two platforms still would have placed the two CPUs on different playing fields. But running DDR with the P4 would have been like setting up a foot race and asking one of the runners to remove a shoe—"Because the other runner could only swing one shoe, and we want this race to be 'fair.'"

Talk about abandoning our self-respect.

WAITING AT THE BUS STOP

I am going to ask something that most people seem to be afraid to ask: What is the hold-up with the bus? I realize that the last great hurdle for the processors was discharge time for the transistors within them. Thankfully, that was overcome, and we won't have to worry about CPU speeds until about 10GHz. But what's the deal with the bus? Why is it so far behind schedule? I read Tom Halfhill's article "Waiting for the Bus" in the December 02 issue and am definitely looking forward to the higher bus speeds in the upcoming system boards. Still, the question remains. What has been the physical hurdle keeping the bus speeds from accelerating at a somewhat relevant rate with the processors?

CONTRIBUTING EDITOR TOM HALFHILL REPLIES: CPU bus speeds aren't keeping up with core speeds because it's more difficult to transmit electrical signals on or off a chip as opposed to inside a chip. Signals that travel from one chip to another (for example, from the CPU to the northbridge, or from the northbridge to memory) must travel a greater distance through wire traces that are more susceptible to interference.

Even if a wire trace on a motherboard is just a few inches long, it's much longer than the metal-layer interconnects within a chip, which are microscopic. It takes more voltage (electrical pressure) to push signals through the chip's pins, the chip's socket, and the board traces. That's one reason why a CPU's input/output (I/O) voltage is typically higher than its core voltage. Interference can originate from nearby power supplies, adjacent board traces, and even from things like radio stations, radar, and cosmic rays. To guard against errors, buses have error-correction circuits that verify every bit they receive, which slows down the bus even more.

Due to these and other factors, CPU bus speeds historically lag behind CPU core speeds. One remedy is to integrate more external functions into the CPU, so the communication is internal. Another is to widen the bus, so it carries more data in a given time period. However, these solutions lead to larger chips with more pins, which cost more to manufacture.

SOME SOUND ADVICE

I was looking into the new Logitech 5.1 speakers that you reviewed in the December issue. I was wondering if hooking the speakers up via the optical port would be the best route, either for OS configuration or for sound quality? I was also curious as to whether there are any special driver or compatibility issues with optical components. Basically, I know nothing about how the optical port is configured. If I buy speakers and hook them up via the optical port, will it just be plug-and-play surround sound?

—BEN MILLER

Sure, we could have run the P4 with DDR memory, but that would have made a mockery of the whole Lab experiment.

TECHNICAL EDITOR WILL SMITH RESPONDS: As a general rule, using the optical output is functionally identical to using the 5.1 analog outputs or using the RCA SPDIF. All you need to do is turn on the optical output in your soundcard's control panel.

Using an optical cable instead of an RCA coax can help get a ground loop problem under control, because the optical cable doesn't conduct electricity. (Ground loops can cause a hum from your speakers and are commonly created when your PC and speakers have separate electrical grounds.) If ground loops aren't a problem, there's no reason to choose optical over a RCA SPDIF. If you have a decent RCA cable, optical doesn't sound better—a digital connection is a digital connection. ■

CUT, COPY, PASTE

➤ **In our December 2002 review of *No One Lives Forever 2* we incorrectly listed the publisher's URL as being www.monolith.com when it's actually www.lith.com.**

➤ **In our December 80GB Hard Drive Royale we said that the Western Digital 800JB has a one-year warranty. It has a three-year warranty.**

➤ **In a caption for the MaXLine II hard drive in December's Quick Start section, we described the drive as having 40GB on each of its four platters. Make that 80GB apiece.**

➤ **The caption for the picture on the bottom of page 70 of the December issue ("How to Put Win XP on a Diet") should have read as follows: "The Services list is ripe for optimization. Here you can disable all the unnecessary services that a home user will never need, but that eat memory and CPU time on your PC."**

➤ **In our December 2002 review of the Sony DRU-500A DVD burner, we inadvertently inverted the colors in the photo of the product. The burner is beige, not black.**

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1-2245.A79

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Liberty Systems. This exciting career field is what you've been looking for! Learn the skills needed to start working right now! With our 12-step training system, you'll be ready to begin

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1-2245.C241

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LIBERTY NAVY

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Manhattan. Justice is the only path toward enlightenment. If

INDEPENDENT MERCHANTS

New Tokyo System. Everybody wants something, and you can be the guy they get it from. There is big profit in crossing enemy lines. We will contact you.

LANE HACKER

New London System. If it's independence you're looking for, we offer you the chance to disrupt the flow of cargo, bust shipments and take what you want.
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Work for yourself and make big profits! Smuggle pharmaceuticals and other commodities across enemy lines, and make your own rules. If you're interested, there are ways you can get initiated.

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Quick Start

The beginning of the magazine, where articles are small

Can the 'Case Modding Channel' Be Very Far Behind?

We give you indisputable proof that the PC underground is now mainstream

A secret axiom of mainstream journalism says that you need only cite three isolated incidents to prove that a trend exists. (This is why postal workers received the unfair distinction of being workplace commandos.) But make no mistake, readers, the PC modding craze really has become mainstream—and we're going to prove as much with 10 indisputable examples.

➤ For the most evidence with the least amount of effort, just turn to the back pages of *Maximum PC*. Nearly every single advertiser is out to distinguish itself with custom colors, case windows, and interior lighting. Xoxide (**www.xoxide.com**) goes the extra mile with detailed side-panel cuts and a shimmering blue intake fan. Just one year ago, the kookiest system in our marketplace section would have simply been painted black.

➤ For the truly detail-oriented, PCMods (**www.pcmods.com**) offers anodized thumbscrews in six colors for your Lian Li case. That's right. *Custom screws*. Have we all gone mad?

➤ Alienware—one of the original high-end, low-volume "boutique" PC manufacturers—has been selling its rigs at cavernous Best Buy stores for months. Jiminy Christmas! This is like Iggy Pop tunes appearing in Mitsubishi car commercials.

Acrylic PSUs?—we've gone too far.

➤ Dynamat, the "sound control material" developed by Dynamic Control (**www.dynamat.com**), was originally designed for automotive use. Now it's also marketed directly to case modders who think their PCs should be seen but not heard.

➤ Not even the power supply can escape the modding craze. The Cutting Edge (**www.cuttingedgecasemods.com**) is offering transparent acrylic shells for your PSU.

➤ At this year's Fall Comdex—a trade show famous for pudgy businessmen with bad comb-overs—the floor was overrun with salespeople hawking every kind of modding accessory imaginable. You couldn't swing a dead cat without hitting an illuminated fan, pimped-out Flex-ATX case, toggle-switch front-bay panel, or heat-pipe VGA cooler.

➤ You're putting the finishing touches on your new rig when you realize you bought a 92mm Wolverine fan grill instead of an 80mm one. *Crap*. No problem—just hop on over to your local CompUSA megastore, which now features an entire section of mod accessories from the PC Toys catalog.

➤ We know of at least one major PC manufacturer that's got plans for a new line of ultra-cool PCs aimed at gamers. This free-wheeling, "we're hip too" maneuver is akin to John McCain and Al Gore appearing on *Saturday Night Live*.

➤ Have you seen nVidia's latest card cooler? Turn to page 40. The thing looks like something created by Nelson Muntz in metal shop.

➤ The Dremel company—long the best friend of woodworkers, craftsman, and other upstanding citizens who own their own lawn mowers—is now actively courting the case-modding community. Check out **www.dremel.com/html/contest/** for the awesome contest results!

CompUSA to case modders: Bring it on!

From Comdex: Proof that there's a case mod for everyone.

But not everyone wants to ride the crazy-case wave. Hotrod PC builder Voodoo Computers told *Maximum PC* that it actually turned down an offer to have its systems distributed by a monster retail chain. Rahul Sood, president of Voodoo, says that mass-production would make it virtually impossible for the company to produce the meticulously assembled, up-to-the-minute systems that have made the relatively small, Canadian company legendary among PC enthusiasts.

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Is the Pen Mightier than the Keyboard?

Logitech introduces "Digital Pen and Paper"

We don't look forward to explaining this to airport security.

Taking notes on a handheld can be like going to a foreign country and speaking a language you know only from a semester of night classes—just trying to get a few words out can quickly degrade into frustration. So Logitech is trotting out a new note-taking gadget based on a familiar friend: the ballpoint pen.

Logitech's gadget—annoyingly named just "io"—has an internal processor and remembers the exact strokes of up to 40 pages of anything you write or doodle.

Just one catch: You have to write on special paper that's covered with a light-gray pattern of tiny dots. When you write on the paper, the io works just like a ballpoint pen, so you can see everything you write. But inside the pen, a tiny digital camera takes 50 snapshots per second when the device is in use. The camera uses the pattern imprinted into the special paper to create "coordinates" out of everything you write (in a process analogous to vector drawing). The coordinates are converted to digital information and stored in the pen's internal memory. The io can also compensate for the angle at which you write.

When you're finished writing, just dump the pen into a USB cradle, and the data is uploaded to your PC. From there, the Logitech software helps you direct the results to whatever application you'd like to send them to. The software includes "limited" character recognition, but we're withholding our enthusiasm for this feature until we've tried it.

TopHead Dual-Head Monitor

A PC Double Feature

We love dual-monitor setups. No question about that. But even slim LCDs sometimes require more desktop real estate than we're willing to sacrifice. So in this month's episode of "Why Didn't We Think Of That," we present the TopHead Dual LCD monitor, available from Savany ($800, **www.savany.com**). It's a classic 15-inch LCD monitor with a native resolution of 1024x768, and perched on top is an independent 6.4-inch LCD with a native resolution of 640x480.

If you've got WinXP, you can configure both monitors via Display Properties, and your mouse can move freely between each screen. While you're at it, you can accessorize the TopHead with an optional TV tuner so you don't miss a daring cleavage shot in *Alias* while working on your term paper in the window below.

The possibilities for the secondary display go on and on. A webcam baby monitor. A tiny Divx theater. A console for tweaking audio settings. All on a screen that's bigger than what you'll find on the back of an airplane seat.

Turbocharger: On-Chip Memory Controller

Microprocessor evolution is largely a trend of higher-scale integration. Over the past 20 years we've seen floating-point units, caches, and other functions migrate onto the CPU chip. AMD's new Athlon 64 and Opteron processors take the next big step by absorbing the memory controller, too. It's like adding a turbocharger to an engine: You'll get an immediate boost in performance.

Think of a memory controller as a traffic cop that manages all the CPU's accesses to main memory (RAM). Lately, there's been a traffic jam on the CPU's frontside bus. That's the interface between the CPU and the memory controller, which is usually on a separate chip called the northbridge, which is part of the core-logic system chipset. The fastest frontside bus on a 32-bit Athlon is 333MHz. Intel's Pentium 4 is faster, at 533MHz. As I explained in December, these bus speeds are lagging behind core clock speeds.

By moving the memory controller off the northbridge and onto the CPU chip, AMD eliminates half of the traffic jam—the slow interface between the CPU and controller. Instead of running at the CPU's bus frequency, the controller can run at the CPU's core frequency, which is 2GHz or more. Better yet, as CPU speeds climb, the controller keeps up. That hasn't been happening in recent years.

Of course, there's a trade-off: The memory controller occupies more die area on the CPU and requires more pins, because now the chip has a direct memory interface as well as a frontside bus. (The CPU still needs a frontside bus for AGP and other purposes.) The larger die and higher pin count will inflate AMD's manufacturing costs.

The Athlon 64 desktop CPU has a 64-bit DDR-SDRAM interface, while the Opteron server CPU has a 128-bit (dual-channel 64-bit) DDR-SDRAM interface. That means 64 or 128 more pins, plus many additional pins for error correction, power, and ground connections. Result: AMD's 64-bit CPUs and sockets cost significantly more to manufacture than their 32-bit predecessors. It will be harder for AMD to undercut Intel's prices and still make a profit.

Also, integrating the memory controller doesn't eliminate the other half of the traffic jam. The controller must still access memory over the DDR-SDRAM interface, which continues to run at 333MHz on the first Athlon 64 and Opteron processors. Meanwhile, Intel is boosting the Pentium 4's frontside bus to 800MHz, which will deliver more raw bandwidth than AMD's memory interface. However, comparisons of raw bandwidth don't account for the extra efficiency of AMD's integrated memory controller. Only a good system benchmark will tell the whole story.

Tom Halfhill was formerly a senior editor for Byte *magazine and an analyst for* Microprocessor Report. *He is now a technical writer/analyst in Silicon Valley.*

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Get a Grid on It

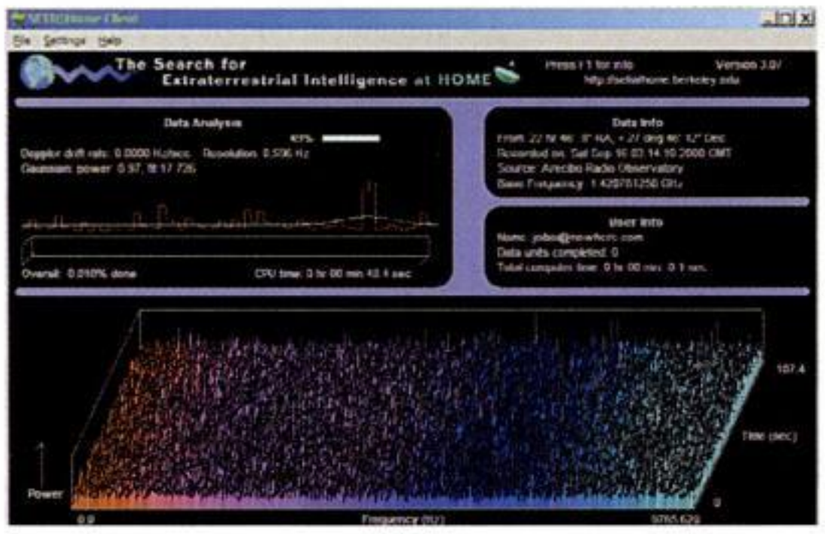
Gateway uses distributed computing to milk its PCs for all they're worth

If you need 3GHz of processing power, you can trot over to any Gateway Country Store and buy it off the shelf. But if you need a little more CPU muscle—say, about 14 trillion floating-point operations per second—Gateway can now sell you that, too. By linking the nearly 8,000 PCs on display at its 274 retail outlets into a giant computing grid, and then selling the processor cycles to other industries, the bovine-themed manufacturer is turning floor models into cash cows.

The service, called Gateway Processing On Demand, would allow companies to perform complex data analysis, simulations, and mathematics without investing in hardware that's expensive to purchase and maintain. And as Gateway upgrades its floor models—which run only the occasional demo and are completely idle at night—the available processing power will rise, as well.

Of course, non- and not-for-profit organizations such as SETI@Home have been taking advantage of the distributed computing model for years. By installing a small application that kicks in whenever a CPU has some free time on its hands, PC altruists have helped sniff the atmosphere for extraterrestrial signals, and have studied protein folding, which could lead to breakthroughs in the diagnosis and treatment of certain diseases. The impact on each individual PC is slight, but the computing power gained in the aggregate is tremendous.

If Gateway's program is a success, computing power could become a commodity that's bought, traded, and sold just like electricity. And it's likely that the trend will extend not just to businesses, but to your desktop as well, where spare CPU cycles might just help you purchase the new videocard you'll need to run *Doom IV* or *V*.

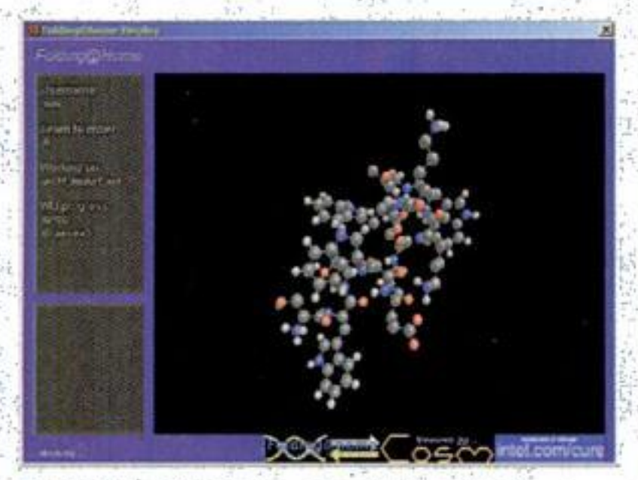


Analyze this: SETI@Home's distributed computing project may have inadvertently inspired a new way for businesses to generate moolah during tough times.

Join the Maximum PC Folding@Home Team!

Unless you don't care about curing diseases and stuff like that

Imagine moving into a new house, opening a box, and watching a refrigerator, dining table, and television assemble themselves and then go exactly where you want them to. That's sort of what proteins do: Whether they're assigned to the "enzyme division" or the "antibody squad," they automatically configure themselves for their assigned tasks in a process called "folding." Unfortunately, they don't always get it right, and researchers now believe that diseases such as Alzheimer's and cystic fibrosis are the result of protein misfolding.



Folding@Home aims to find out why some proteins don't assemble, or "fold," themselves correctly, and to uncover how these mishaps contribute to serious diseases.

Massive computational power is needed to simulate protein folding for study, and Stanford University's Folding@Home is using distributed computing to accomplish this. Now you—yes, *you*—can help lay the foundation for a cure to these syndromes and you'll get a whopper of a cool screensaver to boot. Download the Folding@Home client (a mere 360KB for the command-line version) at **http://folding.stanford.edu** and remember to join Team Maximum PC (team #11108) when prompted to enter your team number.

FUN-SIZE NEWS

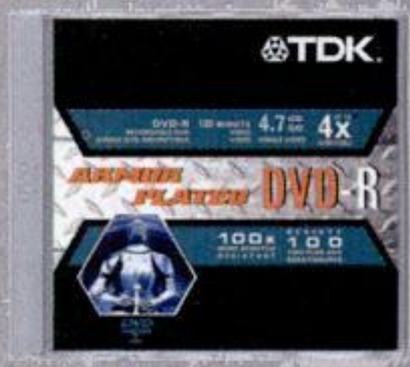
Maxell Says No to 52x Media

Optical drive manufacturers are already generating a buzz for new 56x drive controllers, but Maxell has announced that it will not produce 52x CD-R media to support the latest crop of 52x CD burners. In a press release, Maxell stated that its engineers "...determined that the minimal speed advantage... is outweighed by the performance and safety issues of operating CD-R media in excess of 10,000rpm...."

NY's Bryant Park Goes Wireless

Situated behind the New York Public Library, Bryant Park served as a battleground in 1776 when George Washington's troops fled the British, and was at one time a graveyard for the poor. But now the 161-year-old park has a new distinction—it is possibly the first park in the world to offer free, wireless Internet access to anyone with a laptop or handheld device and a Wi-Fi card. The installation was overseen by NYC Wireless, a volunteer group dedicated to promoting wireless access in public spaces.

TDK Introduces 'Armor Plated' Media



So you're kicking back in Bryant Park and accidentally drop the DVD you just burned onto the grass, where it's immediately set upon by somebody's vicious Rottweiler. Normally, you'd kiss the disc goodbye, and then, if you're a New Yorker, you'd shoot the dog. No more. TDK says that the writing surface of its new Armor Plated recordable DVD media is 100 times more resistant to scratches and wear than garden-variety recordable DVD media. TDK says that its engineers attacked the surface of a disc with steel wool and had nary a problem, and that permanent marker ink "came right off."

No Videogames for You

The clock is ticking for gamers in Honduras (the original "banana republic"). Citing rising street crime, the Honduran Congress unanimously passed a motion to give retailers six months to sell off their inventories of violent computer games before a strict ban goes into effect. Dissenters were quick to point out that 53 percent of the country's population lives below the poverty line, and expensive videogames are likely to be out of reach.

Don't take our word for it.
Stick with what the pros say.

"The latest version, Cool Edit Pro 2.0, is simply smokin'!...I have also used Cool Edit in my studio when other, much more expensive software simply fizzled or choked on a project– CEP2 worked like a charm!"

– Gary Dean Ahrens
DJ Times
September 2002

"A Mac-using colleague said to me recently, 'I hate Syntrillium.' When I asked why he replied 'Because they don't make Cool Edit Pro for the Mac.'"

– Roger Derry
Line Up
The Journal of the Institute of Broadcast Sound
June/July 2002

cool edit | pro
version 2

"Cool Edit Pro is an essential tool for laying down your musical ideas and finalizing them."

– Paul Riario
Guitar World
July 2002

"So here's the deal: If you're looking for a powerful Windows digital audio editing program, download a demo of Cool Edit Pro and check it out."

– Zack Price
Home Recording
October 2002

"Normally after doing a review, I uninstall the program to keep my system as simple as possible. But CEP2 is staying on the hard drive - with a desktop shortcut, too."

– Craig Anderton
Keyboard Magazine
August 2002

"Don't pass on the latest version of this affordable classic if you're into digital audio creation and editing on the PC."

– James Kim
TechTV
August 2002

"There is simply no better deal out there for the professional quality and interface it offers."

– Scott Colburn
Tape Op Magazine
September/October 2002

"Cool Edit is still the coolest thing around for editing audio on the PC."

– Al Peterson
Radio World
July 2002

"There can be few projects that Cool Edit Pro could not handle with ease, finesse and aplomb. The version 2 update has honed what was already an accomplished program."

Computer Music
August 2002

version 2 | The complete multitrack recording studio for your PC | Syntrillium Software

cool edit | pro

The reviews are in and the critics agree: Cool Edit Pro 2.0 is cooler than ever. It's packed with all the latest cutting-edge features for digital audio recording, editing, and mixing. Whether you're already a pro, or just getting started with PC-recording, Cool Edit Pro has the power, features, effects, formats, and flexibility to get the results you want. Even better, Cool Edit Pro users get free access to over 2,000 royalty-free loops of every kind of music imaginable from Loopology.com. You want to pack your PC with the best in audio? Try Cool Edit Pro.

Download your copy today from www.cooledit.com.

Syntrillium Software

P.O. Box 62255 | Phoenix, AZ 85082 USA | 1.888.941.7100 | tel: +1.480.941.4327 | fax: +1.480.941.8170 | sales@syntrillium.com | www.syntrillium.com
toll-free sales, USA and Canada

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VIA Upgrades KT400; Plans Dual P4 chipset

If you've been following VIA for a while, you already know that the first versions of many of the company's chipsets have been a bit rough, and that it's best to wait for VIA's "A" version updates. Did this unfortunate distinction compel VIA to drop plans for a KT333 "A" chipset? We may never know. But VIA will go to plan B when it adds an "A" to the KT400 chipset sometime in early 2003.

The KT400A Athlon XP chipset will reportedly offer not just improved performance, but also official DDR400 support (finally). This is good news, because it looks like 400MHz DDR400 will become a fully sanctioned industry offering—a nice side benefit of Intel putting its support behind the memory type. Intel is rumored to be secretly hammering out Pentium 4s (and an accompanying chipset) that run on an 800MHz frontside bus. This new Intel platform will require dual DDR400 support for maximum performance.

VIA will not adopt a dual-channel chipset for the Athlon XP but it promises improved performance in the upcoming KT400A chipset.

VIA, meanwhile, will continue to make chipsets for the P4 despite the lack of a license. The P4X600 (due early this year) will feature dual-channel DDR support for P4s, as well as support for Kentron's QBM technology, which promises the faster data rates. VIA said it also plans to introduce a dual P4 chipset sometime this year.

30-Second White Paper

This Month: LCDs

Q: If the 15-inch LCD screens found in notebooks routinely offer 1600x1200 resolutions, how come 15-inch stand-alone LCD flat-panels top out at 1024x768, and even 17-inch and 18-inch LCD flat-panels reach just 1280x1024?

A: The answer isn't anything fancy—it just boils down to cost. Gregory D. Nakagawa, senior vice president and general manager of Sharp Systems of America told us, "The low-end of the LCD monitor space is almost entirely price-driven. Thus, to introduce a 'premium' monitor with higher resolution, among the sea of low-cost 15-inch monitors, would not be a strategy any LCD monitor company would embrace."

Laptops are another issue, however. With 15-inch displays at the high-end for today's portables, users demand (and get) higher resolutions.

Mr. Nakagawa also makes the interesting point that "notebook users typically sit 18 to 22 inches from their screen, while desktop users typically sit 22 to 28 inches from their screens." So the finer detail rendered by higher resolutions is, somewhat paradoxically, more likely to be appreciated on a notebook display, however small.

GAME THEORY

BY THOMAS L. McDONALD

When Gaming Worlds Collide

Console gamers often hold up certain titles as cherished totems of the utter uniqueness of TV-based games. For a long time, there simply *was* no PC equivalent of *Metal Gear Solid*, *Zelda*, the *Mario* and *Sonic* series, *Tony Hawk*, the entire Nintendo line, and many others. Console gaming and PC gaming were—and in many ways still are—very different experiences. When this weird, high-school-clique-like schism between PC and console gamers was at its zenith during the golden age of PC gaming in the 1990s, dedicated fans of each could reasonably believe their chosen gaming systems had something special the other could never have.

In the past two years, as PC gaming declined and consoles radically changed shape, those distinctions began to dissolve. Microsoft entered the console market with a machine that matched not only the performance, but (in a game like *Halo*) the content of PC games. Konami brought *Metal Gear Solid* to the PC in a fairly spectacular port. And all three major consoles—PS2, Cube, and Xbox—now offer online gaming. But the clearest indicator that the barriers between PC and console gaming are falling is an incredible Xbox game called *Splinter Cell*. *Splinter Cell* brings certain PC sensibilities to the console, and its console sensibilities will drift back to the computer when the PC port is released next year.

***Splinter Cell* is what you get when you take the core third-person-sneaker gameplay of *Metal Gear Solid* and replace its panting, anime-styled melodramatics with the tone and complexity of a tac shooter like *Ghost Recon*. Let's face it: *MGS* is a great deal of fun, but it's also pretty silly. There's no silliness at all in the dramatic, intense gameplay of *Splinter Cell*. This latest entry in the groundbreaking Tom Clancy series begun with *Rainbow Six* ditches the teammates, moves to the third person, and radically shifts the focus to stealth. The controls become almost transparent, allowing you to focus on assessing each situation and using logic, skills, gadgets, and, rarely, force to complete various covert operations. The result is a remarkably involving, extremely intelligent game using a control system that could only have originated on a console.**

It's tempting to say that PC games gave *Splinter Cell* its brain while console games gave it finesse, but that oversimplifies the issue. It comes to PC not as another console port, but as a nexus point in contemporary gaming, where the best elements converge and create something unique.

Tom McDonald has been covering games for countless magazines and newspapers for 11 years. He lives in the New Jersey Pine Barrens.

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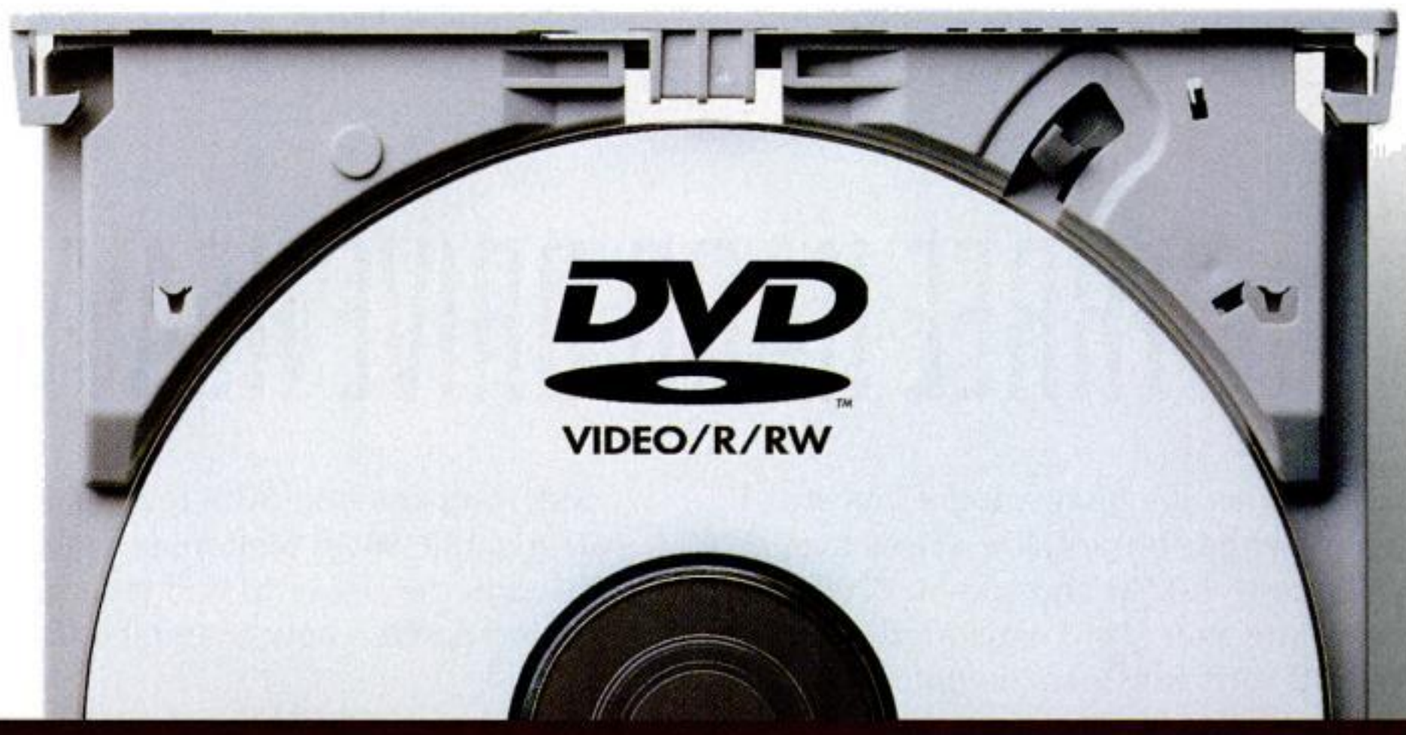
Pioneer sound.vision.soul

pioneerelectronics.com



A recordable DVD format that is already accepted by millions.

The time has come for recordable DVD. Now that you're ready to archive your home movies on DVD and toss those old VHS tapes, you want to make sure that you're choosing the best technology for the job. Join the millions of people who have already chosen DVD-R and DVD-RW to record and archive their own videos with crystal-clear DVD quality.

DVD-R is THE most compatible format. Let's face it, recorded DVDs are most valuable when you can play them back on other DVD players or computer drives. A recent test conducted by *Digital Video Magazine* indicates that DVD-R discs are more likely to play back on other DVD players than any other format of recordable disc tested. And with the price of blank DVD-R media typically being much lower than other formats, recording is also affordable. So if you want to burn a disc and then be able to share it with friends and family, this is the technology you'll want to use.

Pioneer DVR-AO5

DVD-R and DVD-RW are the gold standard. DVD-R and DVD-RW have become the de facto standard for DVD recording with millions of products already in use. DVD-R has been used throughout the professional video and entertainment industries for years and computer manufacturers like Sony® and Compaq® are currently offering DVD-R/RW drives in their latest line of products. Apple® also made the move to install DVD-R drives in many of their new machines.

Pioneer DVR-7000

Why is the DVD Forum important? The DVD Forum was originally formed to create the DVD Video standard. Now, the group that made DVD possible has taken it to the next level, bringing together consumer electronics and computer manufacturers with blank media companies to set the standard for recordable DVD. The DVD Forum approved DVD-R and DVD-RW as official DVD recording standards. Don't settle for imitations. If you want genuine DVD recording, look for the official DVD-R/RW logo.

AV PC DVD R/RW COMPATIBILITY

What are you waiting for? Whether you want to create a DVD of your wedding, a recent family vacation or your child's first piano recital, DVD-R/RWs offer just what you need to burn a disc that can be shared with friends and family. Now is the time to get started. For more information, go to www.pioneerelectronics.com.

DVD Format Comparison	DVD-R/RW	+R/+RW
DVD Forum-approved Format	YES	NO
Original Equipment Drive Manufacturers	Pioneer Panasonic Hitachi LG Toshiba	RICOH
Drives shipped to Market (projected Q4 2002)[1]	3,284,000	1,490,000
Formally supported by DVD Player and ROM Drive Manufacturers[2]	68%	<5%
Compatibility with Existing Players[3]	DVD-R 88% DVD-RW 65%	+R - NA +RW -59%

1. Source: Techno Systems Research
2. Source: Pioneer Electronics Inc.
3. Source: *Digital Video Magazine*, July 2002

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Head2Head2Head

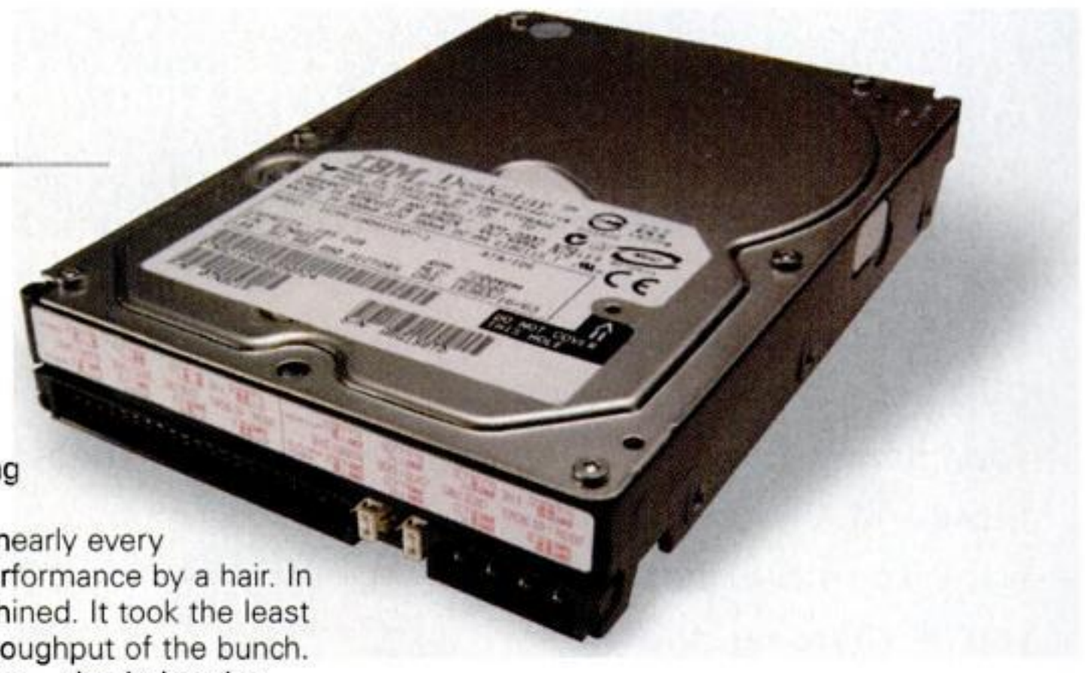
A showdown among natural PC competitors

THIS MONTH: THREE HARD DRIVE HEAVYWEIGHTS

On these two pages, we give you the fastest, biggest, highest-performing IDE drives available. They're all nearly 200GB and spin at 7200rpm. And, for the first time ever, we have a hard drive horse race featuring 8MB caches across the entire field. Western Digital upgrades its JB series, IBM ups the ante with long-coveted SCSI technology, and Maxtor brings its gigantic 80GB platters to play. We ran all the drives through the ringer to find their strengths and weaknesses and name a new champion IDE hard drive.

—BRIAN LAM

IBM DESKSTAR 180GXP



There's a new king of the hill: Top benchmark scores in nearly every performance category make the 180GXP Deskstar our desktop titan. And, in a move that had us cheering, IBM swapped some of the GXP's brain cells with those of a SCSI drive, giving its new IDE drive command-queuing and improved server performance. This 180GB drive won't lick a top-of-the-line, 15,000rpm SCSI screamer, but IBM's revolutionary "Tag and Seek" technology makes this the ultimate IDE drive for server apps—a bonus considering that the 180GXP is the best desktop drive around.

MAXIMUM PC KICK ASS PRODUCT

Without enabling "Tag and Seek" technology, the GXP was tops in nearly every benchmark, trailing only the Western Digital drive in sequential read performance by a hair. In *IOMeter*, under the load of 64 mostly random I/O operations, the IBM shined. It took the least amount of time to respond to each I/O request, giving it the highest I/O throughput of the bunch. This poise under pressure—combined with its read, write, and access performance—also led to the strongest *SYSmark2002* score of the bunch.

When we enabled "Tag and Seek" with a controller card that supports the feature, scores didn't change significantly in our desktop-oriented benchmarks (see page 64 for a breakdown). But using just a run-of-the mill Promise Ultra100 TX2 ATA card, this drive rocked the competition. The IBM 180GXP offers the best of both the server and desktop worlds, and is one kick-ass drive.

MAXIMUM PC VERDICT

Deskstar 180GXP
IBM

www.ibm.com
$270
10

WESTERN DIGITAL WD2000JB

We're all familiar with the WD2000JB formula. Western Digital has ruled the charts for more than a year, wowing desktop drive enthusiasts with the first 8MB cache in an IDE drive. The IBM 180GXP edged out Western Digital's WD2000JB in this month's competition, but a welcome update from 40GB to 60GB platters helped secure the aging Western Digital platform a second-place finish overall.

In our most basic of benchmark tests, the Western Digital and its new platters pulled the fastest average sequential data reads at 46MB/sec—the only top score Western Digital achieved in this roundup. While those fast reads will help with transferring large files, the drive's overall agility was a little behind the competition. Random access times were dead last at 13.6ms, and random access performance hampered the drive's ability to manage lots of tasks at once in *IOMeter*. In *IOMeter*, the drive came in second with 132 I/Os per second, a full 11 I/Os behind the Deskstar. The synthetic *IOMeter* test results hint at what our real-world *SYSmark2002* test confirms: The Western Digital hit 163 points to the IBM's 165 points. The Western Digital was simply beaten by a newer, younger drive (though by only the slimmest of margins).

This drive isn't bad, per se. It just needs a more significant update than the greater areal density offered by 60GB platters. Still, if you can't forget the reliability problems suffered by IBM's 75GXP (and therefore aren't ready to take your chances with the 180GXP), the time-tested Western Digital 2000JB will make you feel safe. It's just as large and nearly as fast.

MAXIMUM PC VERDICT

WD2000JB
WESTERN DIGITAL

www.wdc.com
$350
9

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MAXTOR ULTRA SERIES 200GB

When we last reviewed a Maxtor drive built on insane 80GB platters (see the "80GB Hard Drive Royale" in December 2002), the drive had great sequential transfer speeds, which are very important for video workstation duties. Unfortunately, the drive lacked drive head agility while multitasking in *IOMeter*. The latest Ultra series 200GB drive is the largest high-performance Maxtor we've ever seen, and now comes complete with an 8MB buffer. Unfortunately, it still doesn't muster an immense amount of I/O operations per second, and can't compete with the latest IBM and Western Digital drives for sequential reads and writes.

Maxtor is still pushing 80GB per platter, but Western Digital and IBM are now creeping up a bit, hitting 60GB per platter. The upshot is that the new Maxtor 200GB gets lost in the crowd. It managed 44.8MB/sec in sequential reads, and 27MB/sec in writes. The new Maxtor did turn in better random access times (13.2ms) than its predecessor, but, strangely, *IOMeter* benchmark scores didn't benefit from the drive's new agility: A laggy score of 114 I/Os per second is disappointing (well, at least in terms of this competition). We can only surmise that mediocre access speeds, sequential transfer rates, and multitasking abilities caused the new Maxtor to score 158 points in *SYSmark2002*.

We're willing to overlook poor scores in synthetic benchmarks, but the Maxtor drive was last place in all our benchmarks. Don't be wowed by the 80GB per platter areal density or 8MB buffer. This drive is fantastic in the big scheme of IDE performance, but just third-rate in this competition.

MAXIMUMPC VERDICT

ULTRA SERIES 200GB
MAXTOR

www.maxtor.com
$350
8

DARE to COMPARE	WD2000JB	IBM 180GXP	MAXTOR ULTRA
SYSmark 2002 Office	163	**166**	158
HDTach Average Sequential Read	**46MB/sec**	45.5MB/sec	44.8MB/sec
HDTach Average Sequential Write	26 MB/sec	**27.7 MB/sec**	27 MB/sec
HDTach Random Access Time	13.6ms	**13ms**	13.2ms
IOMeter Total I/Os per second	132	**143**	114
IOMeter Average I/O Response Time	483ms	**448ms**	562ms

Best scores are printed in bold. For "HDTach Random Access Time" and "IOMeter Average I/O Response Time", lower numbers are better. For all others benchmarks, the higher are better. IBM 180GXP test were done with command queuing disabled, using the same promise Ultra100 TX2 controller card other drives used.

SPECS	WD2000JB	IBM 180GXP	MAXTOR ULTRA
Capacity	200GB	180GB	200GB
Spindle speed	7,200	7,200	7,200
Buffer size	8MB	8MB	8MB
Areal density	60GB/platter	60GB/platter	80GB/platter

HOW WE TEST HARD DRIVES

We ran the following tests in our basic zero-point system, which includes an Intel D850MV mobo, a 2GHz P4 CPU, 512MB of PC800 RDRAM, and a GeForce4 Ti 4600 videocard.

➤ *SYSmark2002* measures overall system performance in real-world apps, and its Office Productivity script is particularly drive-intensive. This is our ultimate measure of how a drive impacts your overall computing experience.

➤ *HDTach* takes a blank drive, and reads or writes to it, from beginning to end, all in a single action. Unlike *IOMeter*, the *HDTach* activity is sequential: Instead of chewing through numerous pieces of data scattered all over the place, the benchmark manipulates a large chunk of data that's written across continuous drive sectors. *HDTach* reports peak, low, and average transfer rates for reads and writes. While gigantic, continuous reads and writes are uncommon for regular desktop use, they do occur when editing large video and audio files. More critical to overall performance is the *HDTach* Random Access Test, which reports how long it takes for a drive to move its head from one random location to another.

➤ Our *IOMeter* script forces the drive to manipulate 8Kb tic-tacs of data as quickly as possible, writing one 8Kb chunk for every four reads. From one task to another, there's an 80 percent chance that the next chunk of data will be randomly placed (in other words, the data won't be located where the drive head is currently situated). The script is a good barometer of how well a drive might perform when you're loading complex apps with many DLLs, or when working with multiple files simultaneously.

THE UPSHOT

If you've got an IDE hard drive that's at least a year old, any of these beauties would be a handsome upgrade—though a simple glance at our benchmark chart reveals that the IBM reigns supreme. Hard drives may not be advancing at the pace of CPUs or videocards, but they are finding their way into the performance spotlight. And if you think your hard drive doesn't affect overall system performance, pay closer attention to our subtle—but telling—*SYSmark2002* benchmark. Our zero-point machine scores just 143 in this test using its "stock" Western Digital 1200BB drive featuring a 2MB cache. That's about 23 points behind the 180GXP reviewed here! This is the kind of difference you'd get from a minor CPU upgrade.

Got an older drive? Upgrade it. *Now*. Your overall performance—not to mention load times during gaming—will noticeably improve.

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WatchDog

Say hello to **Madison**, WatchDog of the Month.

Maximum PC takes a bite out of bad gear

THIS MONTH: The WatchDog goes after...

> Apple **>Refurbs** **>MP3Bundle.com**

Give the Dog a Bone

The Dog is still looking for ISP billing horror stories. Specifically, did an ex-ISP of yours get purchased by another ISP and then subsequently start billing you for services not rendered? Please send your tales of woe to the watchdog@maximump.com with the subject line "Bogus Billing."

Never Trust a Ferengi

DEAR DOG: I admit I'm a geek. I purchased and downloaded *QuickTime Pro 5* in July because I wanted to see the full-screen trailer of *Star Trek: Nemesis*. I also used the software to view other trailers and media content suitable for *QuickTime*.

This morning, while changing my *QuickTime* preferences, I received a friendly notification that an update to my player was available. I was about to update my player when I received a message saying, "If you proceed with this update you will have to buy a new product key." I cannot believe the lobes on these people! I spent $30 a few months ago and now, because I want to upgrade the product, I have to spend another $30. I went to the Apple/*QuickTime* web site to contact someone and was unsuccessful. I found a disclaimer saying, "We cannot answer e-mail inquiries specifically," and noticed that there's a $49 charge for phone help.

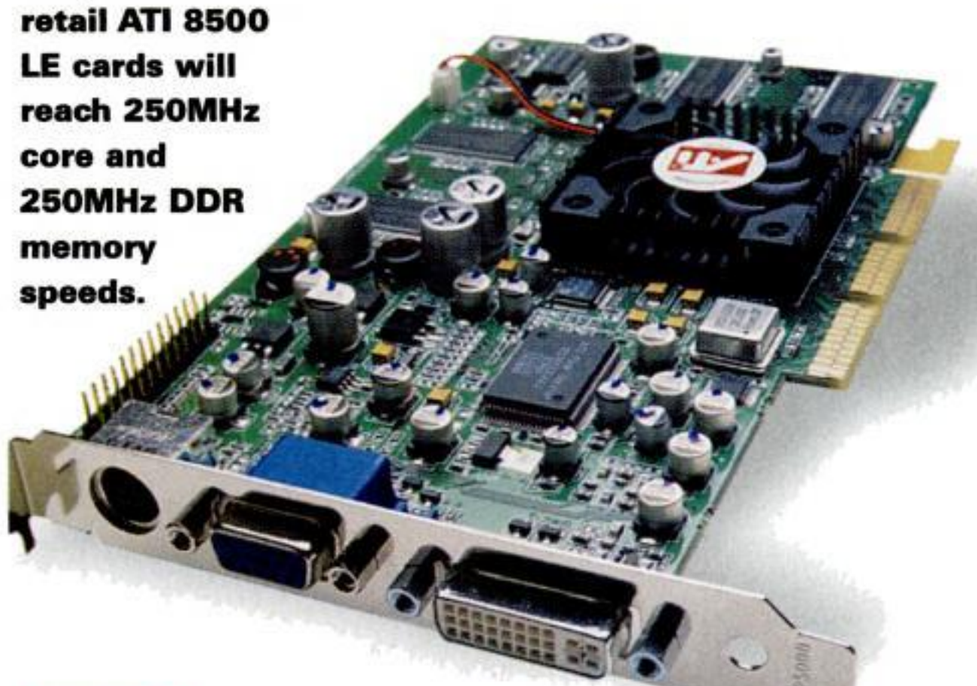
I'm now concerned because I want to reformat my computer for maintenance purposes. If I do that, I can only download *QuickTime 6* and I won't get the *Pro* that I paid for just a few short months ago. I don't have anyone at Apple or QT to contact so I thought I'd turn to you.

— ROB IPPOLITO

Star Trek buffs who paid for *QuickTime Pro 5* in advance to see the trailer for *Star Trek: Nemesis* weren't pleased by Apple's fee to update to *QuickTime Pro 6*.

THE DOG RESPONDS: The Dog must quote the first Ferengi Rule of Acquisition: "Once you have their money, you never give it back." Apparently Apple is familiar with this rule. The Dog assumes you downloaded and paid for the *Pro* key in early July, because on July 15 the company began selling *QuickTime Pro 6*. Those who purchased the *QuickTime Pro 5* keys prior to that date are out of luck, which brings to mind Ferengi Rule 15: "Satisfaction is not guaranteed." Apple says that MPEG4 capabilities as well as numerous other updates make *Pro 6* a full-point release, thereby justifying a $29 upgrade fee. The company didn't totally hose *QuickTime 5* customers though. The company continues to offer *QuickTime Pro 5* for download to those who refuse to upgrade. Download version 5 at: http://docs.info.apple.com/article.html?artnum=120133

Apple says that MPEG4 capabilities as well as numerous other updates make Pro 6 a full-point release, thereby justifying a $29 upgrade fee.



Only boxed retail ATI 8500 LE cards will reach 250MHz core and 250MHz DDR memory speeds.

Rip-Off or SOP?

DEAR DOG: I'm not sure if I've been wronged or not. I built my first PC a few months ago and decided to include Western Digital's 8MB cache 100GB drive. Well, the drive went bad and after a bit of a goof-up I received a replacement. The new drive looked like a refurbished unit. Western Digital said the full warranty still applies to the part, but I'm a little concerned that I was ripped off.

— NAME WITHHELD BY REQUEST

ThE DOG RESPONDS: Your experience is well within the fine print spelled out in Western Digital's Limitation of Remedies clause which says: "Your exclusive remedy for any defective Product is limited to the repair or replacement of the defective Product. WDC may elect which remedy or combination of remedies to provide in its sole discretion... WDC's replacement Product under its limited warranty will be manufactured from new and serviceable used parts."

Western Digital isn't alone of course. Most consumer product warranties give the manufacturer the right to repair the product or replace it with another product. In many cases, the replacement is a refurbished component.

While we're on the subject of hard drives, Roger Lewis wrote the Dog to say he disagreed with hard drive manufactures' reasons for cutting warranties from three years to one year:

"Maxtor is BSing you big time. No cash is set aside to sit around for three years

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awaiting warranty repairs. Cash is expended on warranty repairs only when the repairs are made. I've been involved in corporate accounting for 30 years (yeah, I know!) and know of what I speak. The short version of what happens is that before Maxtor records a profit for drives sold in a given year, it reduces that profit by the expected cost of warranty repairs to the drives sold that year based on its historical warranty experience. In other words, a reserve for warranty repairs is created by reducing reported profits. What's in the books has nothing to do with cash. I'm now telling you more than you ever wanted to know, but rest assured, piles of money are not sitting in the vault in anticipation of warranty repairs that, according to Maxtor, may never happen.

"As for Western Digital and Seagate, why maintain these humongous databases solely for warranty purposes? Do you think your new Sunbeam toaster is individually recorded in some database? The real problem is that profit margins on HDs are razor thin and manufacturers have to cut costs, and limiting warranties to one year is one way of accomplishing this. And consider this: If the drives were so reliable, there'd be minimal cost to extending the warranty beyond one year."

Le Videocard

DEAR DOG: I have a complaint about the 8500 LE series of cards. I purchased an 8500 LE because of two reasons: The unofficial 250MHz core/250MHz DDR memory and the great price. When I got the card home, however, I found that it was clocked at a disappointing 230/230. I found a press release on the ATI web site stating that the 8500 LE is to run at 250MHz. What gives?

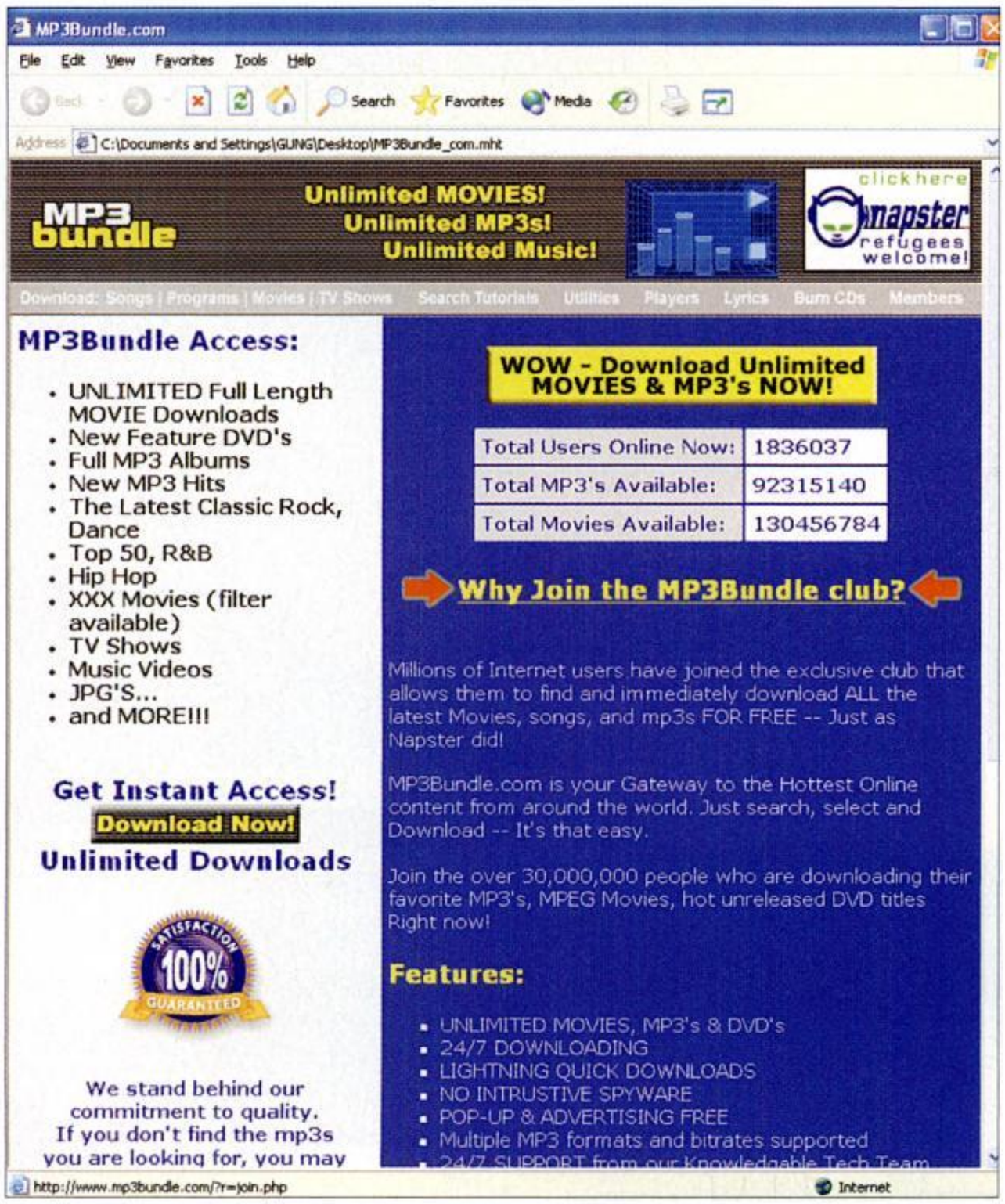
— JEREMY

THE DOG RESPONDS: This isn't truly a new issue. The Dog visited this fire hydrant in March of 2002 when reader Michael Pintar reported that he was supposed to have received a Radeon 8500 clocked at full speed from ComponentAuthority.com but ended up with the 230/230 version instead. The Dog put ComponentAuthority in the dog house at the time, and the company web site has gone 404. The real meat of Jeremy's question is, What exactly is the speed of a Radeon 8500 LE? According to an ATI spokeswoman, the LE version of the card is rated for 250MHz core and 250MHz DDR memory. However, that applies only to the ATI retail-boxed version of the card. OEM or bare versions of the card may not be at that clock speed, the spokeswoman said. Any reputable store or web site selling a card should be able to tell you the card's clock speed.

In Jeremy's case, the card apparently *was* a boxed ATI product. The spokeswoman said it was impossible for the card to have left ATI in a retail box at the lower speeds. So what could have happened? It's highly likely that someone purchased the 250/250 part at the store, swapped it with his or her slower 230/230 part and returned it. The card was then resold to Jeremy.

There's two lessons here: The first is that if it's an OEM or bare-bones part, it may well vary from the retail version of the product. The second lesson is to make sure that you what you were buying is indeed in the box.

The ATI spokeswoman offered to contact Jeremy, and if he did have a retail part, take care of it.



A reader claims that after he paid this web site, all he received was software that was already available for free.

Dirty Deal

DEAR DOG: I wanted to let your readers know how I got burned today. I visited the site MP3bundle.com and saw that it was offering unlimited downloads of MP3s, movies, TV shows, etc. for the low price of 97 cents a month with a two-year commitment, or $1.50 per month. I thought, OK, somebody has figured out how to do this legally. For a little more than $20, it's a good deal. Once I ponied up my credit card number, the only thing I received was instructions on how to download *Kazaalite* and then do a search using this software which is obviously already free! I've demanded a refund and will wait the two days the auto responder said it will take before turning to the credit card company for a refund. I wanted to get the warning out now, though.

— RAY SHENK

THE DOG RESPONDS: The Dog tried to reach MP3bundle.com representatives but was unsuccessful. The web site is registered out of Rawalpindi, Pakistan, and e-mail sent to the admin and registrant bounced back. The Dog was unable to locate any other contact info on the MP3bundle.com web site. This isn't really a new phenomenon. The Dog has heard of other "deals" that offered people the ability to duplicate DVDs. Once paid for, all they received is a CD or links to software that's already publicly available for ripping DVDs (there are now commercial packages for these products though.) It sounds like your only recourse is through your credit card company, but other readers should be reminded to follow the old adage: If it sounds too good to be true, it probably is. Woof. ■

"Once I ponied up my credit card number, the only thing I received was instructions on how to download Kazaalite, and then do a search using the software which is obliviously already free!"

Got a bone to pick with a vendor? Been spiked by a fly-by-night operation? Sic The Dog on them by writing **watchdog@maximumpc.com**. The Dog promises to get to as many letters as possible, but only has four paws to work with.

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ULTIMATE PC FIX-IT GUIDE

NEXT MONTH:

WINDOWS TROUBLESHOOTING

In our March issue, we'll complete our Fix-It Guide with the full 411 on deciphering Windows error messages. Stay tuned!

Scott Mueller is the author of *Upgrading and Repairing PCs*, now in its 14th edition. This 1,600-page, Geek Tested & Approved manual is a favorite reference source among the *Maximum PC* editors. If you have any questions about his book or this article visit **www.upgradingandrepairingpcs.com**.

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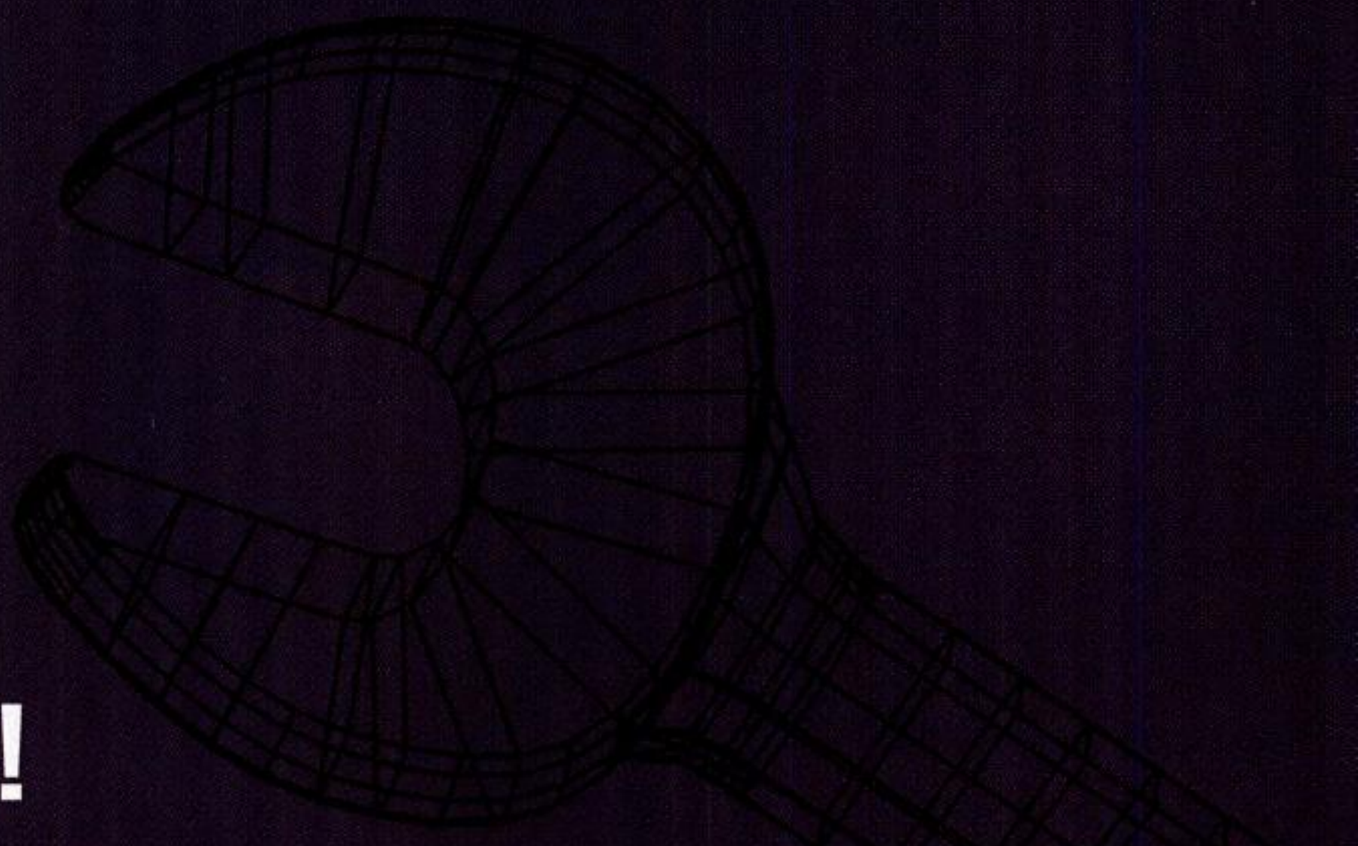
YOUR DEFINITIVE GUIDE TO PC TROUBLESHOOTING.

IDENTIFY, ISOLATE, AND EXTERMINATE EVERY PROBLEM!



BY SCOTT MUELLER

The modern PC is an utterly incredible collection of hardware and software. Consider: There are 55 million transistors in the Intel Pentium 4, nearly 4.3 billion transistors in 512MB of RAM, and hundreds of millions of transistors in your motherboard chipset, video processor, and so on, and so on. Each of these *billions upon billions* of interconnected transistors not only has to function properly, but must operate in an orderly fashion within strictly enforced timing windows, some of which are measured in picoseconds (trillionths of a second)!

When you realize that your PC will lock up or crash if any one of these billions of transistors fails to operate properly and on time—or if any one of the billions of circuit paths between the transistors fails in any way—it's a wonder that PCs work at all

When I watch a system move through its startup sequence, transforming in 30 seconds from a cold, lifeless box into a fantastically capable machine that's practically alive with light, sound, and energy, I think about the billions of components that had to function properly. As you can see, there are many opportunities for problems to arise.

Luckily, modern design and manufacturing techniques have made PCs more reliable and easier to service despite their ever-increasing internal complexity. Today's systems have fewer and fewer replaceable components and individual parts, which is sort of a paradox: As PCs have become more complex, they have also become simpler and easier to service in many ways!

By understanding the basics of how PCs work, and applying some basic logical thinking and common sense, you can effectively diagnose and repair your own system. The bottom line with troubleshooting PC problems is that there's a solution for every problem. This article will focus on basic troubleshooting concepts, as well as list—and fix—the most common and troublesome PC problems.

And even if your particular problem isn't addressed in this story, you should still glean enough information about troubleshooting theory to fix your own PC yourself!

Wireframe artwork by Richard Pepper

Industry Standard Replaceable Components

The use of industry standard components is a key feature of all PCs—virtually all of the parts that make up a system are interchangeable with other systems in some manner. This means that the parts are plentiful, inexpensive, and generally very easy to install. If you're a regular reader of this magazine, you already know that most PCs have fewer than 20 "parts," while some may have as few as 10 or 15, depending on how many options are present, and how they're integrated.

From a hardware troubleshooting perspective, one of these components will be either improperly installed, configured, or defective. If improperly installed or configured, the component can be "repaired" by merely reinstalling or reconfiguring. If defective, the component can simply be replaced. When a PC is broken down to the basic replaceable parts, you can see that it really isn't that complicated, which is why I've spent my career helping people to easily perform their own repairs and upgrades.

Reinstall or Replace?

When dealing with hardware problems, the simple truth is that we don't normally repair anything—we reinstall or replace.

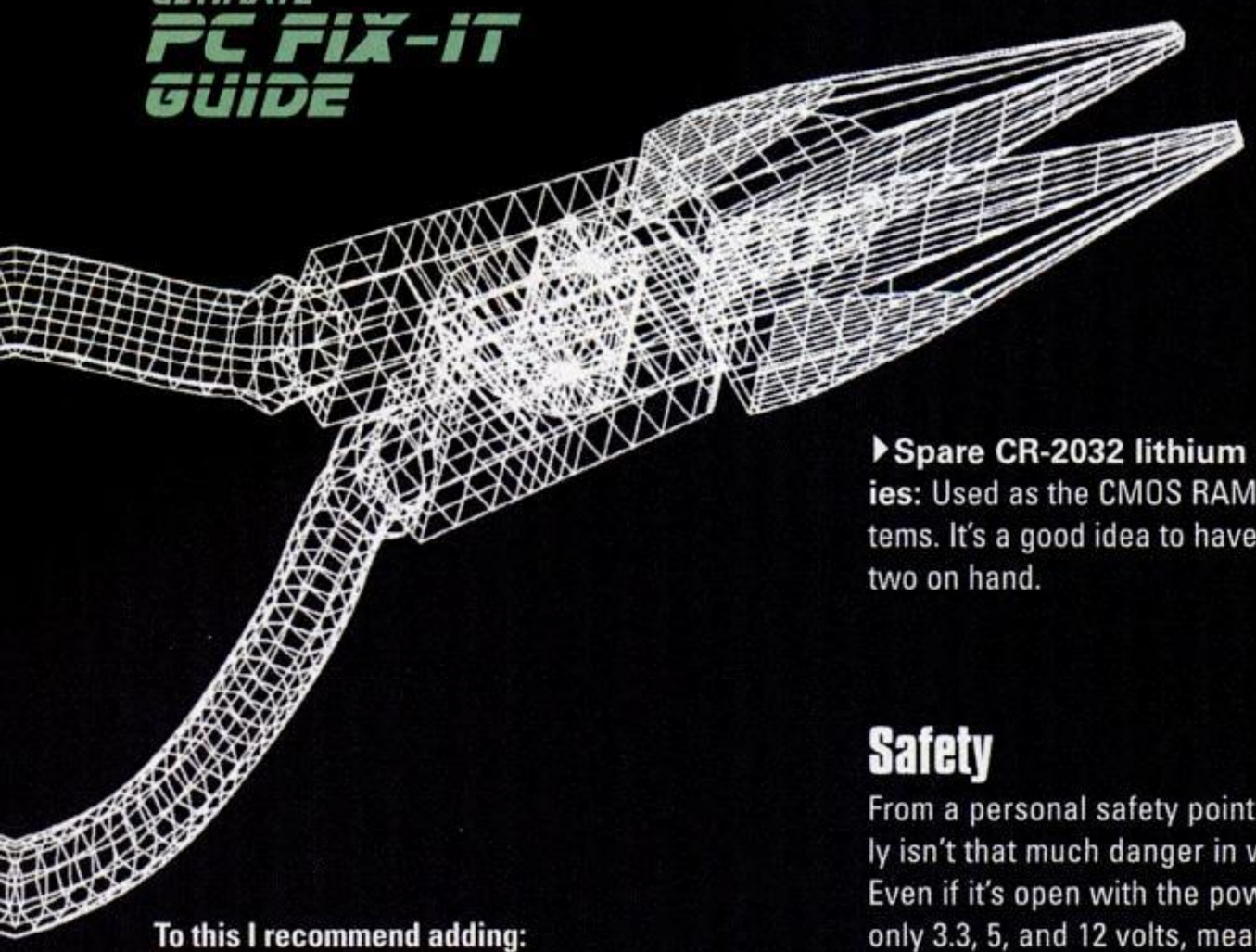
I remember hearing from IBM many years ago that the company had found that 60 percent or more of the problems handled by its service technicians were due to improper installation or configuration; the hardware wasn't actually defective. This was in fact the major impetus behind the plug-and-play revolution, which has eliminated the need to manually configure jumpers and switches on most hardware devices, minimizing the expertise needed to install hardware properly. Still, plug-and-play has sometimes been called "plug and pray," as it occasionally requires manual intervention to get things to work. Nonetheless, many PC problems can be fixed with a reinstallment of either hardware or software; parts are rarely "repaired."

Similarly, it's often cheaper to replace a failed circuit board than to repair it. For example, you can purchase a new motherboard for around $100, but to repair an existing board would normally cost much more. Even if you could figure out which chip had failed, and had the equipment to replace it, the chips themselves are usually sold in quantities of thousands, and obsolete chips aren't normally available. The net effect of all this is that the replaceable components in your PC have become disposable technology.

Troubleshooting Tools

The tools needed for component-swapping, rebuilding, testing, and troubleshooting are basic. Start with a simple PC toolkit, which can cost anywhere from $15 to $100 or more, depending on what's included. These can be found in most any electronics or computer store. More elaborate kits can be found from high-quality suppliers like Jensen tools (www.jensentools.com). The simplest of these kits will normally include:

- **Hex nut drivers:** Used to remove chassis and other screws.
- **Phillips and standard flat-blade screwdrivers:** For removing screws. (Be careful with the flat-blade drivers around motherboards!)
- **T-15 Torx driver:** Many systems use Torx screws since they're superior to others for retention and grip.
- **Tweezers and/or chip puller:** For grabbing jumpers, screws, and other small parts, the chip puller is great for removing keycaps from keyboards.
- **Claw-type parts grabber:** For picking up loose screws or other parts dropped in a system.



To this I recommend adding:

▸ESD (electro-static discharge) protection kit including wrist-strap and mat: Prevents static damage to components.

▸Needle nose pliers and hemostats: Great for jumpers, gripping small items, straightening bent pins, etc.

▸Electric screwdriver (such as the Black & Decker 9073): Combined with hex, Phillips, standard, and Torx bit sets, it really speeds up repetitive disassembly/assembly.

▸Flashlight: Preferably a high-tech LED unit, which will allow you to see inside dark systems and will be easy on batteries.

▸Windows 98 startup floppy: Has DOS 7.0 and real-mode CD-ROM/DVD drivers, which can be used to boot test the system and possibly load other software.

▸Windows 2000/XP original (bootable) CD: Can be used to boot test the system from a CD-ROM/DVD drive, attempt system recovery, OS installation, or to run other software.

▸Diagnostics software: Commercial, shareware, or freeware software for PC hardware verification and testing.

▸POST (Power On Self Test) card, such as the Post Probe from www.micro2000.com: For displaying POST diagnostics codes on systems with fatal errors.

▸Nylon cable-ties: To help in routing and securing cables (neatly routed cables help to improve airflow in the system).

▸Digital pocket multimeter: For checking power-supply voltages, connectors, and cables for continuity.

▸Cleaning swabs, canned air, and contact cleaner chemicals: For cleaning, lubricating, and enhancing contacts on circuit boards and cable connections.

▸Spare CR-2032 lithium coin cell batteries: Used as the CMOS RAM battery in most systems. It's a good idea to have a replacement or two on hand.

Safety

From a personal safety point of view, there really isn't that much danger in working on a PC. Even if it's open with the power on, PCs run on only 3.3, 5, and 12 volts, meaning there are no dangerous, life-threatening voltages present. But there are dangerous voltages inside the power supply and monitor. Most power supplies have 400 volts present at some points internally, while color displays have between 50,000 and 100,000 volts on the CRT! Normally I treat the power supply and monitor as components that are replaced and not repaired, and I don't recommend you open either of them unless you really know what you are doing.

Before working on a PC, you should unplug it. Do this not to protect yourself, but to protect your system. Modern ATX formfactor systems are always partially running—as long as the system is plugged in, there are standby voltages present, even if it's turned off. If you accidentally turn the system all the way on, and then plug in or remove a card, you can fry the card or the motherboard.

ESD (electro-static discharge) protection is another issue. While working on a PC, you should wear an ESD wrist strap, which is clipped to the chassis of the machine. This will ensure that you and the system remain at the same electrical potential, and will prevent static electricity from damaging the system as you touch it. Some people feel that the system should be plugged in to provide an earth ground. That's not a good idea at all. No "earth" ground is necessary; all that is important is that you and the system remain at the same electrical potential. I recommend that you use a commercially available wrist strap, rather than making your own. Commercially made wrist straps feature an internal 1 Meg ohm resistor that's designed to protect you. The resistor will ensure that you're not the best path to ground should you touch any "hot" wires.

When you remove components from the system, place them on a special conductive antistatic mat, which is also a part of any good ESD protection kit. The mat will also be connected via a wire and clip to the system chassis. Any components removed from the system should be placed on the mat. The connection between you, the mat, and the chassis will prevent any static discharges from damaging the components.

Troubleshooting Techniques

There are several ways to troubleshoot a PC, but in the end it often comes down to simply reinstalling or replacing parts. That is why I normally use a very simple "known-good spare" technique that requires very little in the way of special tools or sophisticated diagnostics.

Let's say you have two identical PCs sitting side by side. One of them has a hardware problem; in this example, let's say a memory module is defective. Depending on how and where the defect lies, this could manifest itself in symptoms ranging from a completely dead system to one that boots up normally, but crashes when running.

You observe that the system on the left has the problem, but the system on the right works perfectly. Otherwise, the systems are identical. The simplest technique for finding the problem would be to swap parts from one system to another, one at a time, re-testing after each swap. At the point when the DIMMs are swapped, upon powering up and testing (in this case "testing" is nothing more than allowing the system to boot up

There's one thing that's true about nearly every PC in the world: It's dark in there. We've been using those wee LED lights for some time, but here's something better. The Lightwave 2000 is a flashlight with four bright LEDs that will never burn out. And hey—it's waterproof! $30, www.longlight.com

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and run a while), you find the problem has moved from one system to the other. Knowing that the last item swapped was the DIMM, you have just identified the source of the problem!

This didn't require a $2,000 DIMM test machine or any diagnostics software. Since components such as DIMMs aren't economical to repair, replacing the defective DIMM is the obvious solution.

Simplistic, yes, but this technique is often the quickest and easiest way to identify a problem component. Instead of having an identical system standing by to borrow parts from, most technicians will have a large inventory of known-good spares. Note that these spare parts are different than new replacement parts, because when you open up a box containing a new component, you really can't be 100 percent sure it works. I've been in situations where I've had a defective component, replaced it with a defective new component, and the problem remained. This has led to a lot of wasted time checking other parts that were fine.

Another strategy is the "bootstrap approach," which is especially good for what seems to be a dead system. You take the system apart, strip it down to the bare minimum of components, and see if it works. For example, this would entail stripping a system down to the chassis/power supply, bare motherboard, CPU/heatsink, one bank of RAM, and a videocard, then powering it up to see if it works.

In this stripped configuration, you should see the POST screen or splash logo screen on the display, verifying that parts inside are functional. If a keyboard is connected, you should see the three LEDs (capslock, scrlock, numlock) flash within a few seconds after powering on. This is a sign of the POST routines testing the keyboard, indicating that the CPU and motherboard are functioning.

Once the system is functioning with a minimum of components, methodically reinstall or add new parts (for example, a modem, soundcard, or extra memory module), testing the system each time you make a change to verify it still works and that the part you added or changed wasn't the cause of a problem. Essentially you're rebuilding the system from scratch, using your existing parts, but doing it one step at a time.

Many times problems can be caused by corrosion on contacts or connectors, so often the mere act of disassembling and reassembling a PC will "magically" repair it. While it may seem that everything is installed exactly like it was before, in reality the mere act of unplugging and replugging renews all of the slot and cable connections between devices, which is often all a system needs.

Here are some other useful tips:

- Eliminate unnecessary variables or components that aren't pertinent to the problem.
- Reinstall, reconfigure, or replace only one component at a time. Test after each change you make.
- Keep a detailed record of each step you take.
- If you hit a roadblock, take a break or work on another problem. A fresh approach the next day often reveals things you overlooked.
- Don't overlook the simple or obvious; double- and triple-check the installation and configuration of each component.
- Keep in mind that power supplies are one of the most failure-prone parts in a PC, as well as one of the most overlooked components. A high-output known-good spare power supply is highly recommended.
- Cables and connectors are also a major cause of problems—keep replacements of all types on hand.

Diagnostics

If you suspect there's a problem with something at the core of your system (like the motherboard, processor, or possibly the RAM), the only way to know for sure is to reinstall or replace the item. While you can purchase expensive memory testing machines, there really is no such thing as a motherboard or processor testing machine, at least not outside of manufacturing plants. However, there are diagnostic programs available for testing motherboards, processors, and RAM. For diagnostic software to run, the system must be healthy enough to boot from a disk, then load and run the diagnostic application. If the system is sufficiently "dead," software diagnostics will be useless.

Diagnostic software can verify what components in a mostly functional system are working properly, and are especially good for "exercising" a system to suss out any stress or heat-related problems. Most PC manufacturers perform what they call "burn-in" testing of new hardware: They run the hardware for a day or so under "more extreme than normal" use, to flush out problems that might later occur in a customer's home. Solid-state hardware failures will typically happen early if they're going to happen at all. Most PC diagnostics software can be used for burn-in testing as well.

POST Cards: Your New Best Friends

PCs can have problems that render them unable to boot, or to load and run diagnostic software. While a common response would be to replace the motherboard, processor, or RAM, a tool known as a POST (Power On Self Test) card can take advantage of the diagnostics built into almost every motherboard and help to identify problems.

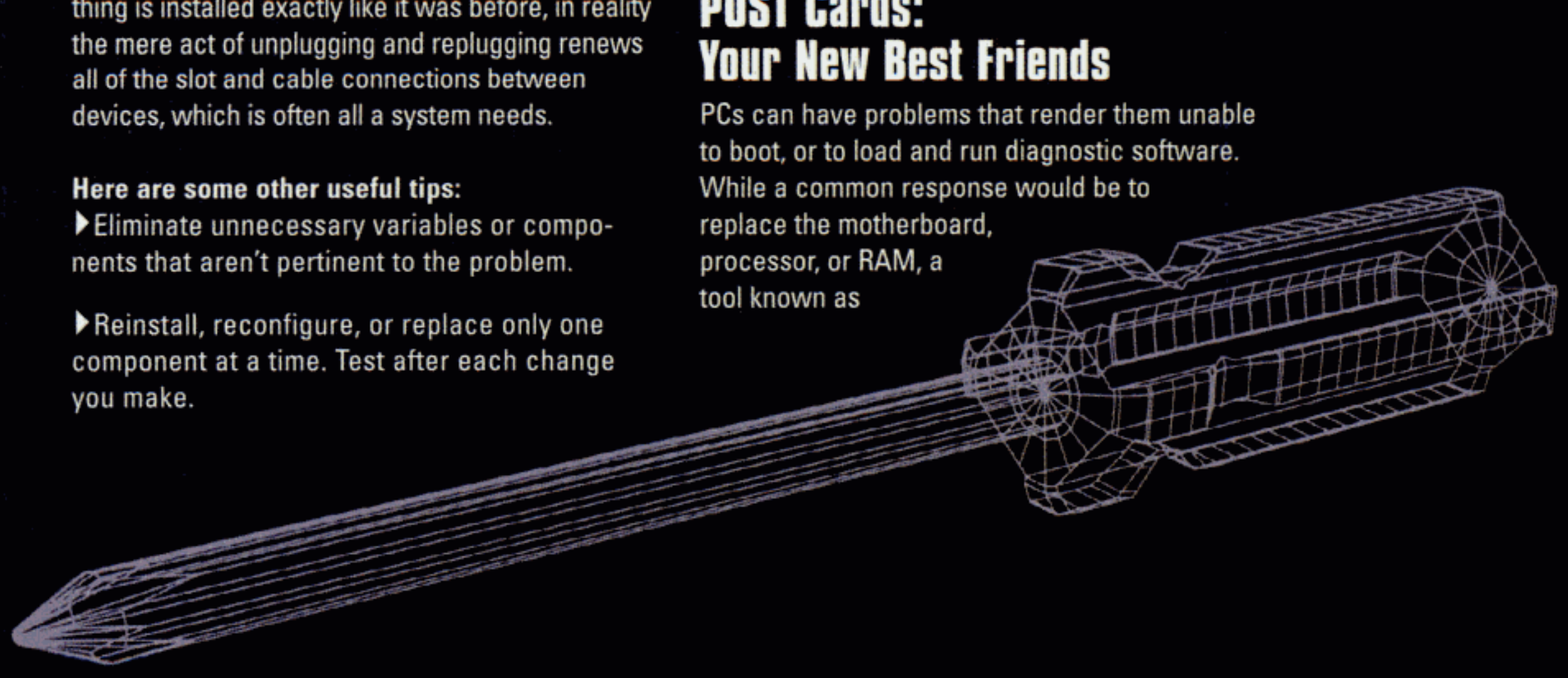
The POST is a series of diagnostic tests that are built into the ROM chip on virtually all motherboards. These routines normally run on a cold start (that is, upon powering up the system), perform a quick integrity test of the system, and possibly communicate an error if a problem is found. Much of these routines run before the videocard is initialized, and if there's a critical error in that early phase of the startup sequence, it will be impossible for the system to display an error message. These errors are normally called *fatal errors* because, for all intents, the system seems dead, with nothing on the display. Some systems will use rudimentary beep codes to communicate errors in this situation, but often there won't be a beep code for the particular problem that occurred.

What many people don't know is that the POST routines also send up to 256 different 2-digit hexadecimal checkpoint codes to I/O address 80h in the system—an address designed to be read by a POST card!

POST cards plug into a PCI or ISA bus slot, and were originally designed to be used by the motherboard manufacturer or system builders for testing bare boards. However, they have since been adopted by technicians in the field. POST cards don't contain any software or diagnostics. They only display the codes sent to port 80h by the POST. The specific checkpoint codes vary from BIOS to BIOS, and you can find them either in the documentation for the motherboard or the particular BIOS you have, or in the manual that comes with the particular POST card you're using.

The POST checkpoint codes are normally sent before each step of the test is initiated, so if the machine stops with a fatal error, you can look at the POST card to read the last checkpoint displayed. Then, by looking up that checkpoint number for your particular motherboard/BIOS, you can discover what step was running when the board died. This can often help identify which component on a board has failed.

Unfortunately, often the result is that you'll be replacing the motherboard anyway, in which case the only advantage to the POST card is that you'll know exactly why you are replacing the board!



Next Up:
Specific Problems ▶

Your Most Vexing PC Problems—Solved!

Scott explains the troubleshooting basics behind a collection of reader complaints

When I power up the system, I see the power LED light and hear the fans spin, but nothing else ever happens.

The fact that the LEDs illuminate and fans spin indicates that the power supply is partially working, but that doesn't exclude it from being defective. This is a classic "dead" system, which can be caused by almost any defective hardware component.

In my experiences, I've had more problems with power supplies than most other components, so I'd immediately use a multimeter to measure the outputs at the power supply connectors, and ensure they were within the proper 5 percent tolerances of their rated voltages. Even if the voltage measurements checked out, I'd swap in a high-quality, high-power, known-good spare supply, and retest. If that didn't solve the problem, I would revert to the "bootstrap approach" mentioned on page 25, and strip the system down to the bare minimum of components.

If the motherboard now starts, begin adding the components one at a time, retesting after each change. If the symptoms remain, then use a POST card (if you have one) to see if the board is partially functional, and where it stops. Also try replacing the videocard, RAM, CPU, and then finally the motherboard. Finally, verify your CPU and heatsink installation.

I see a "STOP" or "STOP ERROR" in Windows NT/2000/XP.

Many different things—including corrupted files, viruses, incorrectly configured hardware, or failing hardware—can cause Windows STOP errors. The most valuable resource for handling any error message displayed by Windows is the Microsoft Knowledge Base (MSKB), an online compendium of more than 250,000 articles covering all Microsoft products.

You can visit the MSKB at **http://support.microsoft.com**, and use its search tool to retrieve information specific to your problem. For example, say you were receiving "Stop 0x0000007B" errors in Windows XP. In that case you would visit the MSKB at the address listed above, then enter the error message in the search box. I entered "stop 7B error Windows XP" in the box, and it returned two articles, one of which was titled: "HOW TO: Troubleshoot 'Stop 0x0000007B' Errors in Windows XP."

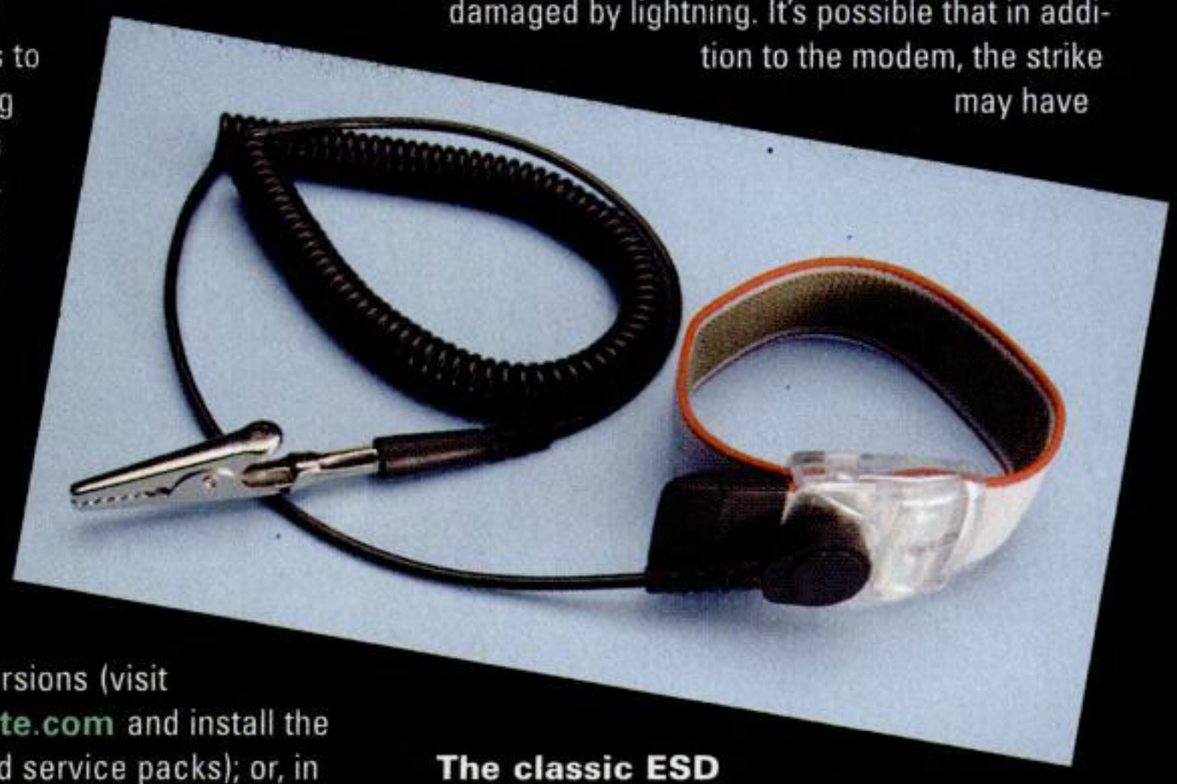
The article had a complete description of the problem and solutions, and stated that the error could be caused by "boot-sector viruses, device driver issues, hardware issues, and other issues." The article proceeded to explain each issue and solution in detail. All things considered, the MSKB is a valuable resource when dealing with any problems related to, or reported by, any version of Windows or any other Microsoft software.

I see "Fatal Exception" errors in Windows 95/98/ME.

This is the equivalent of the STOP error in Windows NT/2000/XP. As indicated in the previous answer, this can be caused by both hardware and/or software problems, and the best place to check for specific solutions is in the Microsoft Knowledge Base (MSKB).

The system won't shut down in Windows.

This is another example where the MSKB comes to the rescue. By searching for "shutdown problems Windows XP," for example, you will quickly find several articles that will help you troubleshoot this type of problem. This problem can be caused by bugs in motherboard ROM (try upgrading your motherboard ROM to the latest version); bugs in the various Windows versions (visit **www.windowsupdate.com** and install the latest fixes, patches, and service packs); or, in some cases, configuration or hardware problems. I'll defer to the MSKB articles for more complete explanations of the Windows issues.



The classic ESD (electro-static discharge) strap. Think of it like this—would you want your doctor to perform internal surgery without washing his hands? No, you would not. So don't put your delicate components at risk from static electricity. You do not, by the way, need to have your PC plugged in for the strap to work. $5, www.radioshack.com

The modem doesn't work.

First verify that the phone line is good, and that you have a dial tone. Then check and (if necessary) replace the phone cable from the modem to the wall outlet. If the modem is integrated into your motherboard, check the BIOS setup to ensure that the modem is enabled. Try clearing the ESCD (enhanced system configuration data) in the BIOS setup. This will force the plug-and-play routines to reconfigure the system, which may resolve any conflicts.

If the modem is internal, and you aren't using the COM1/COM2 serial ports integrated into the motherboard, try disabling the serial ports to free up additional system resources. Also try removing and reinstalling the modem drivers (always use the most recent drivers from the manufacturer). If that doesn't help, try physically removing and reinstalling the modem. If the modem is internal, try installing it in a different slot. If the modem is external, make sure it has power and is properly connected to the serial or USB port on the PC. Try replacing the external modem power brick and the serial/USB cable. Finally, if you get this far and it still doesn't work, try replacing the modem and finally the motherboard.

Note that modems are very susceptible to damage from nearby lightning strikes. Consider adding lighting arrestors or surge suppressors on the phone line running to the modem, and unplug the modem during storms. If the modem has failed after a storm, you can be almost certain it's been damaged by lightning. It's possible that in addition to the modem, the strike may have

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damaged the serial port or motherboard. Any items damaged by lightning will most likely need to be replaced.

The keyboard doesn't work.

If you're having problems with a USB keyboard, check to be sure that "USB Legacy Support" is enabled in the BIOS. If you're still having problems, make sure you have installed the latest BIOS for your motherboard and any Windows updates from Microsoft as well. Some older systems can never properly use a USB keyboard, in which case you should change to a PS/2 keyboard instead. Some keyboards feature both USB and PS/2 interfaces, which offers the flexibility to connect to pretty much any system.

If the keyboard is a PS/2 type, and is having problems, the quickest way to verify whether the problems lie with the keyboard or the motherboard is to replace the keyboard with a known-good spare. If the spare keyboard doesn't work, then most likely the keyboard controller on the motherboard is defective, meaning the entire board will need to be replaced.

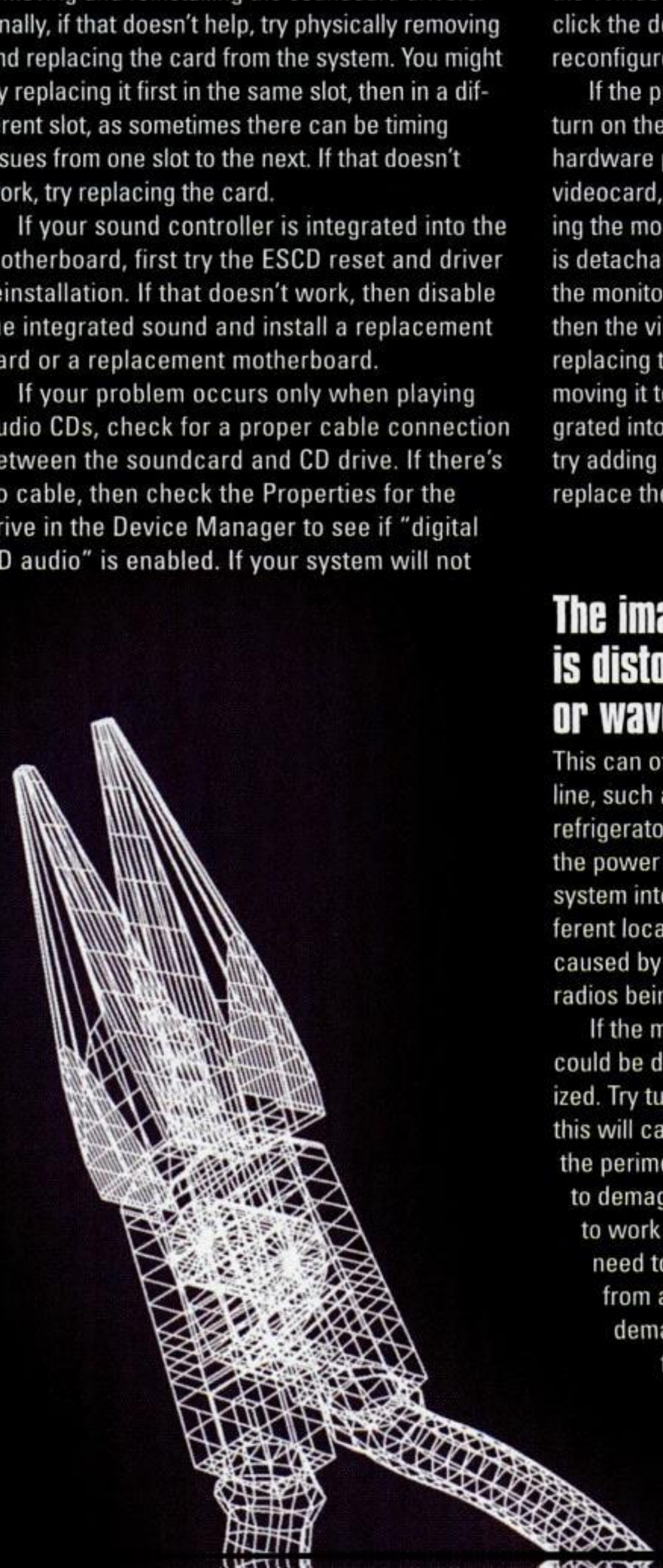
I can't hear any sound from the speakers.

This can often be as simple as the speakers being unplugged or powered off, so don't overlook the obvious! Also check the volume controls in Windows or your application to ensure they're turned up and not muted. Once you're sure the volume is turned up and that your speakers have power and are plugged in, you'll need to verify if the problem is with the speakers or the soundcard.

First, connect different known-good speakers. If you still get no sound, then clearly the issue is in the soundcard, possibly with the configuration of the card, or else the card itself may be defective. First try clearing the ESCD (enhanced system configuration data) in the BIOS setup. This will essentially force the plug-and-play routines to reconfigure the system, which may resolve any conflicts. If that doesn't help, try removing and reinstalling the soundcard drivers. Finally, if that doesn't help, try physically removing and replacing the card from the system. You might try replacing it first in the same slot, then in a different slot, as sometimes there can be timing issues from one slot to the next. If that doesn't work, try replacing the card.

If your sound controller is integrated into the motherboard, first try the ESCD reset and driver reinstallation. If that doesn't work, then disable the integrated sound and install a replacement card or a replacement motherboard.

If your problem occurs only when playing audio CDs, check for a proper cable connection between the soundcard and CD drive. If there's no cable, then check the Properties for the drive in the Device Manager to see if "digital CD audio" is enabled. If your system will not allow digital CD audio to be enabled, then you'll need to install an analog cable connected between the soundcard and the CD drive.



The monitor appears completely garbled or unreadable.

A completely garbled screen is most often due to improper, incorrect, or unsupported settings for the refresh rate, resolution, or color depth. Using incorrect drivers can also cause this. To check the configuration of the card, the first step would be to power on the system and verify that you can see the POST (or system splash screen). If the screen looks fine during the POST, but goes crazy once Windows starts to load, then almost certainly the problem is due to an incorrect setting or configuration of the videocard. To resolve this, boot the system in Windows "Safe Mode" (hold down the F8 key as Windows starts to load). This will bypass the current video driver and settings, and place the system in default VGA mode. Once the Windows Desktop appears, you can right-click the desktop, select Properties, and then reconfigure the video settings or change drivers.

If the problem occurs from the moment you turn on the system, then you definitely have a hardware problem—most likely involving the videocard, video cable, or monitor. First try replacing the monitor with another one, and if the cable is detachable, try replacing that too. If replacing the monitor and cable don't solve the problem, then the videocard is probably defective. Try replacing the card (or, if it's a PCI-based card, try moving it to a different slot). If the video is integrated into the motherboard, then you'll have to try adding a separate card instead. Or you can replace the motherboard.

The image on the display is distorted: bent, shaking, or wavering.

This can often be due to problems with the power line, such as an electric motor, air conditioner, or refrigerator causing interference. Try replacing the power cord, plugging the monitor and/or the system into a different outlet, or moving it to a different location entirely. I've also seen distortion caused by local radio transmitters, or by two-way radios being operated in the vicinity of the system.

If the monitor image is bent and discolored, it could be due to the shadow mask being magnetized. Try turning the monitor on and off repeatedly, this will cause the built-in degaussing coil around the perimeter of the tube to activate in an attempt to demagnetize the shadow mask. If this seems to work partially but not completely, you may need to obtain a professional degaussing coil from an electronics or TV service shop to demagnetize the mask. Next, try replacing the monitor cable, try a different known-good monitor, and, finally, try replacing the videocard.

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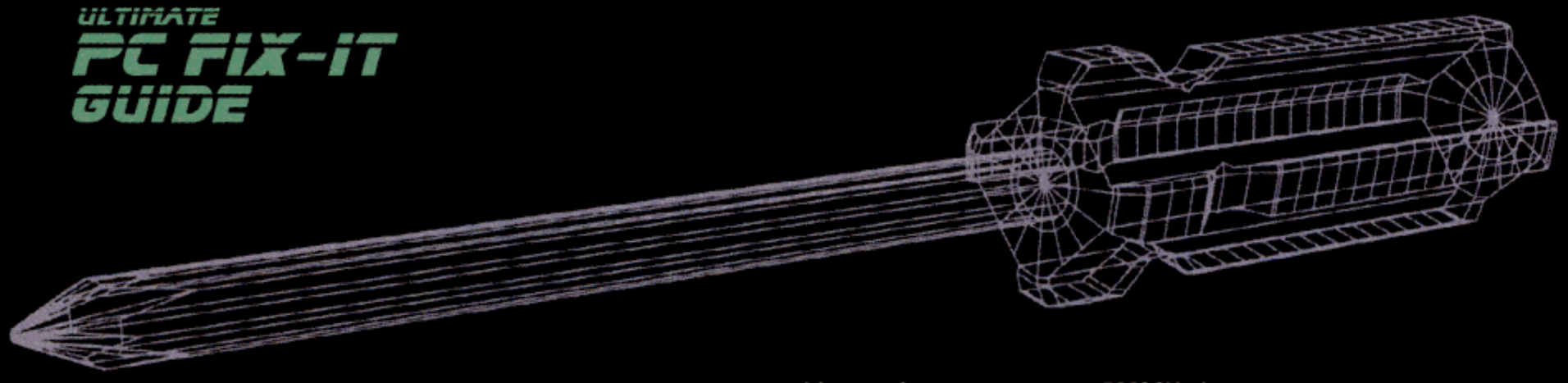


I installed an upgraded processor but it won't work.

First make sure the motherboard supports the processor that's installed, and that you're using the latest BIOS. Check with the motherboard manufacturer to see if any BIOS updates are available for download, and if so, install them.

Check the jumper settings (on older boards) or BIOS screens to verify that the processor is identified and set properly with respect to the frontside bus speed, clock multiplier, and voltage settings. Make sure the processor is set to run at its rated speed and isn't overclocked. If any of the CPU settings in the BIOS setup are on manual override, try setting them to automatic. Try reseating the processor in the socket. Make sure the heatsink is properly installed, and that you're using thermal interface material (thermal grease) at the mating junction between the CPU and heatsink. And, of course, always consider the following:

- The CPU must fit in the socket! Most Pentium 4 and newer Celeron processors use Socket 478; Pentium III and older Celerons use Socket 370; and Athlon/Duron processors use Socket 462 (Socket A).

- The motherboard must support the voltage required by the CPU. Modern motherboards set voltages by reading VID (voltage ID) pins on the processor, and then setting the onboard VRM (voltage regulator module) to the appropriate settings. Older boards may not support the generally lower voltage requirements of newer processors.

- The motherboard ROM BIOS must support the CPU. Modern boards also read the CPU to determine the proper bus speed and multiplier settings for the CPU. Many CPUs have different requirements for cache settings and initialization, as well as bug fixes and work-arounds.

- The motherboard chipset must support the CPU. In some cases, specific chipset models or revisions may be required to support certain processors.

- Often there will be BIOS updates available that may allow newer processors to be supported in older boards, beyond what was originally listed in the manual when you purchased the board.

- If you're considering replacing an existing Pentium 4 with a new Hyper-Threading technology version, you need to verify that the motherboard supports the new processor. Specifically, the board will need to have one of the more recent chipsets, it must support a 533MHz bus speed, and incorporate a setting in the BIOS to enable or disable the Hyper-Threading technology. Some pre-existing boards may be able to do this with only a BIOS upgrade, but other boards will not meet the chipset and FSB requirements.

The system runs fine for a few minutes, then freezes or locks up.

This is the classic symptom of an overheated system. If the system is brand new or custom built, then it's possible that the design is insufficient for proper cooling, and bigger heatsinks, more fans, or other solutions may be required. If the system once worked fine, but is now exhibiting the problem, then check to see if the problem started after any recent changes were made, such as the installation of new video drivers. If so, then the change could be the cause of the problem. If not, then most likely something like a cooling fan has either failed or is beginning to fail.

Modern systems should have several fans: one inside the power supply, one on the CPU (or positioned to blow on the CPU), and optionally others for the chassis. Verify that any and all fans are properly installed and spinning. They shouldn't be making grinding or growling noises, which normally indicates bearing failure. Note that many newer systems have thermostatically controlled fans, and it's normal for the fan speeds to change with the temperature. Make sure that the chassis is several inches from any walls, and that fan ports are unobstructed.

Try removing and reseating the processor. Reinstall the CPU heatsink with new thermal interface material. Check the power supply, and verify that it's rated sufficiently to power the system (most supplies should be 300 watts or more). Use a digital multimeter to verify the voltage outputs of the power supply; they should be within plus or minus 5 percent of the rated voltage at each pin. Try replacing the power supply with a high quality replacement or known-good spare.

I purchased an upgraded AGP videocard and it won't fit in the slot.

Most newer AGP cards are designed to conform to the AGP 4x or AGP 8x specifications, which run on only 1.5 volts. Most older motherboards with AGP 2x slots are designed to accept only 3.3-volt cards. If you plugged a 1.5-volt card into a 3.3-volt slot, both the card and motherboard could be damaged, so special keys were incorporated into the AGP spec to prevent disasters. Normally the slots and cards are keyed such that 1.5-volt cards will only fit in 1.5-volt sockets, and 3.3-volt cards will only fit in 3.3-volt sockets. There are also universal sockets that will accept either type of card.

I'm experiencing intermittent problems with the hard drive.

Most systems use ATA (commonly called IDE) hard drives, which consist of a drive and integrated controller, a ribbon cable, and a host adapter circuit in the motherboard. Most often, intermittent problems are found with the cable and the drive. It is far more rare that the host adapter will fail or exhibit problems. Many problems occur with the cables. ATA drives use either 40-conductor or 80-conductor cables. Drives supporting transfer rates higher than ATA/33 (33MB/sec or Ultra DMA Mode 2) must use 80-conductor cables. Check the cable to be sure it's not cut or damaged, and try replugging it into the drive and motherboard. Make sure that the cable isn't more than 18-inches in length, which is the maximum allowed by the ATA specification. This is especially important when you're using the faster ATA/100 or ATA/133 transfer rates. Try replacing the cable with a new 80-conductor, 18-inch version.

If replacing the cable doesn't help, try replacing the drive with a spare, installing an OS, and testing it to see if the problem remains. If so, then the problem is with the motherboard, which will most likely need to be replaced. If not, then the problem is most likely with your original drive. You can simply replace it, or try testing, formatting, and reinstalling to see if the drive can be repaired. To do this you will need the test software provided by the drive manufacturer. Here's where the popular drive companies keep their utilities:

- **Seagate**—ftp://ftp.seagate.com/techsuppt/seagate_utils/sgatfmt4.zip or www.seagate.com/support/seatools

- **IBM**—www.storage.ibm.com/hdd/support/download.htm

- **Maxtor/Quantum**—www.maxtor.com/softwaredownload/default.htm

▶**Western Digital**—www.wdc.com/service/ftp/drives.html **or** www.wdc.com/service/ftp/wddiag/wd_diag.exe

If any problems are found, use the option in the software to initialize or low-level format (LLF) the drive. Note that this will wipe *everything* off the drive, so you'll want to back up any files you wish to preserve. After the LLF, you'll need to partition the drive, format each partition (high-level format), then install the OS, drivers, applications, and backed-up data. If you're using Win98 or a later Windows OS on an original Microsoft bootable CD with a system that supports (and which is configured for) CD booting, you can simply boot to the OS CD immediately after the LLF. The OS installation routines will prompt you through the partitioning and formatting process as part of the installation. After the OS installation, you'll need to install your hardware drivers and applications, and then restore your data files. If the drive still exhibits problems after reformatting, then you'll have to replace the drive.

Note that you can run the *IBM DFT* (drive fitness test) program (available for free from the IBM site) on non-IBM drives. The program, however, will not be able to repair or LLF these drives. Still, the program is a good test of any drive—more in-depth than *Scandisk* or other utilities provided with Windows.

The system won't boot. It says "Missing operating system" on the screen.

When your system boots, it reads the first sector from the hard disk, called the MBR (master boot record), and runs the code contained in that sector. The MBR code then reads the partition table (also contained in the MBR) to determine which partition is bootable and where it starts. Then it loads the first sector of the bootable partition (called the volume boot record, or VBR), which contains the OS-specific boot code. But before executing the VBR, the MBR checks to be sure the VBR ends with the signature bytes "55Aah." The "Missing operating system" message will be displayed by the MBR if it finds that the first sector of the bootable partition (the VBR) doesn't end in "55Aah." Several things can cause this to occur:

▶ The drive parameters entered in the BIOS are incorrect or corrupted. Incorrect parameters will cause the MBR program to translate differently and read the wrong VBR sector, thus displaying the error message. A dead CMOS battery can also cause this, since it will lose or corrupt the stored drive translation and transfer mode parameters. In fact, in my experience, a dead battery is one of the more likely causes.

▶The drive isn't yet partitioned and formatted on the system. This is a normal error if you try to boot the system from the hard disk before the OS installation is complete. Boot to an OS start-up disk (floppy or CD), and run the SETUP program, which will prompt you through the partitioning and formatting process.

▶The MBR and/or partition tables are corrupted. This can be caused by boot sector viruses, among other things. To repair, cold boot from a known-good, non-infected, write-protected floppy or bootable CD containing the *FDISK* program (preferably Win98 or later). Enter "FDISK /MBR" at the command prompt, which will recopy the MBR code, but not alter the partition table. Reboot. If the message persists, and you need to recover the data on the drive, you'll either need to rebuild the partition tables from scratch using a third-party utility like the *DISKEDIT* program included with the Symantec *Norton Utilities*, or hire a data-recovery specialist who can do this for you. If you don't need to recover the data on the drive, then simply reinstall the OS from scratch.

▶The VBR is corrupted. To repair with Windows 95/98/ME, secure a bootable floppy created by the same OS version as is on the hard disk, and containing the SYS command from that OS. Run `SYS C:` which will recopy a good VBR and system files to the volume. For Windows NT/2000/XP, you can use the *Recovery Console* or *DiskProbe* utilities (found on the bootable OS CD).

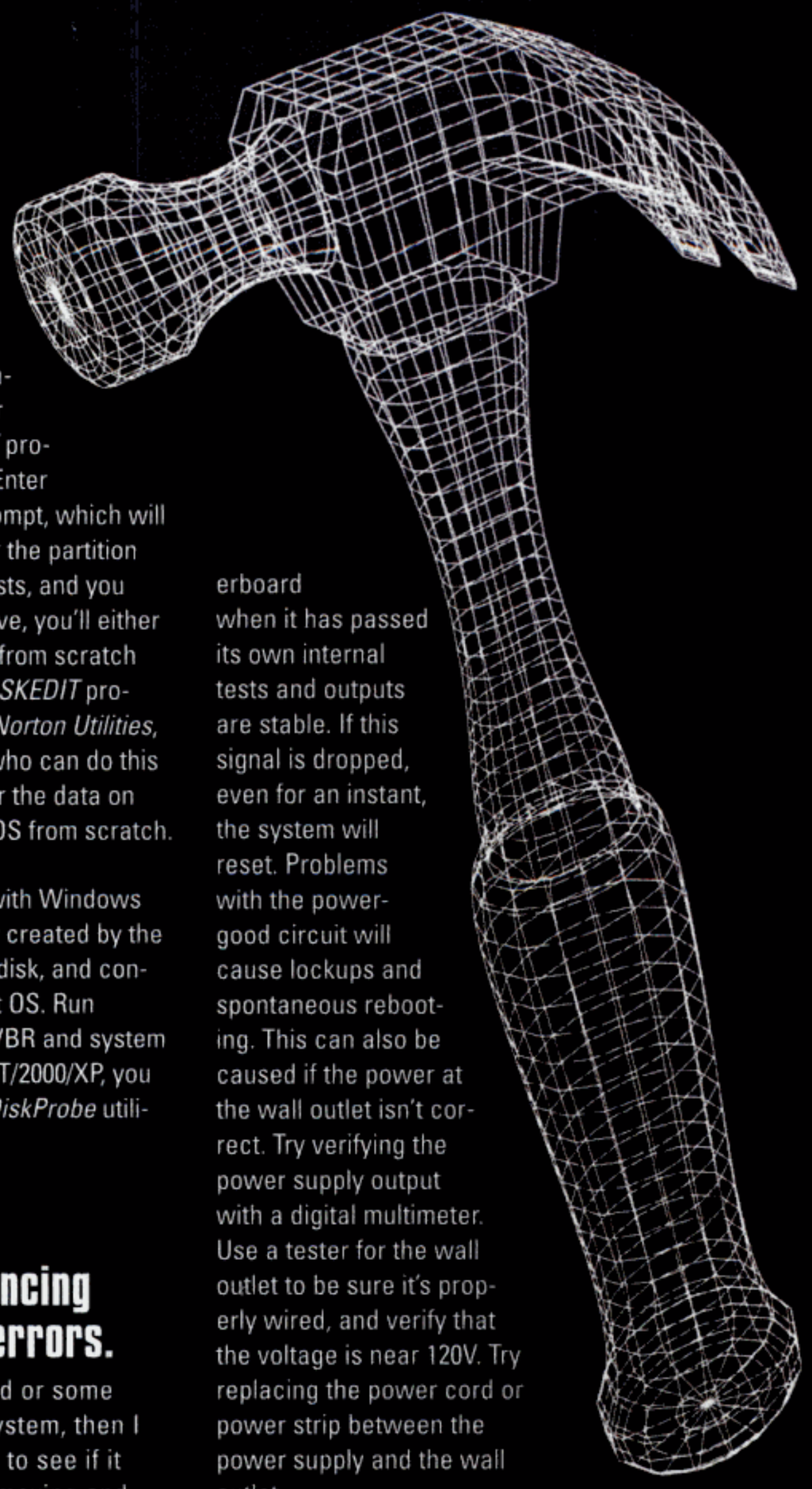
The system is experiencing intermittent memory errors.

If the memory was recently added or some other change was made to the system, then I would undo that addition/change to see if it was the cause. If not, then try removing and reseating all memory modules. If the contacts look corroded, try cleaning them with contact cleaner, and then apply contact enhancer for protection. Check the memory settings in the BIOS setup, generally all settings should be on automatic. Try upgrading to the latest BIOS for your motherboard. Try removing all memory except one bank. Next try running just one bank of memory, but in the second or third bank position. It's possible for a socket to develop a problem, and most motherboards don't require that the sockets be filled in numerical order. Try replacing the remaining module with one of the others that were removed, or a new module, or a known-good spare.

If you get this far, then the problem is most likely either the motherboard or the power supply, or possibly some other component in the system.

The system locks up frequently and sometimes reboots on its own.

This is one of the classic symptoms of a power supply problem. The power supply is designed to send a special "power-good" signal to the motherboard when it has passed its own internal tests and outputs are stable. If this signal is dropped, even for an instant, the system will reset. Problems with the power-good circuit will cause lockups and spontaneous rebooting. This can also be caused if the power at the wall outlet isn't correct. Try verifying the power supply output with a digital multimeter. Use a tester for the wall outlet to be sure it's properly wired, and verify that the voltage is near 120V. Try replacing the power cord or power strip between the power supply and the wall outlet.



Unfortunately, the intermittent nature of this problem makes it hard to catch. If the problem isn't with the wall outlet power, then the best recourse is generally to replace the power supply with a high-quality new unit or a known-good spare of sufficient rating (300 watts or higher). If this doesn't help, try reseating the CPU and reinstalling the heatsink with new thermal interface material. Try reseating the memory modules. Try running only one bank of memory. Finally, try replacing the motherboard.

I installed a 60GB drive in my system, but it's only recognizing 8.4GB.

Motherboard ROM BIOSes have been updated throughout the years to support larger and larger drives. The following capacity limits were broken in the following months: 528MB in August 1994; 8.4GB in January 1998; and 137GB in September 2002.

You can use the BIOS Wizard utility from www.unicore.com/bioswiz/index2.html, which will tell you the BIOS date of your system,

and whether your system supports the "Enhanced Hard Disk Drive" specification, which means drives over 8.4GB. If your BIOS doesn't support EDD (drives over 8.4GB) then there are three possible solutions: Upgrade your BIOS to a version that supports more than 8.4GB; install a BIOS flash upgrade card like the ATA Pro Flash from www.firmware.com; or install a software patch to add 8.4GB support.

I almost never recommend the last solution, as it merely installs a software patch in the boot sector area of the hard drive, which can result in numerous problems when booting from different drives, installing new drives, or recovering data.

The 137GB barrier is a bit more complicated because there are not only BIOS issues, but also OS and chipset-based ATA host adapter driver issues. Drives larger than 137GB are accessed using 48-bit LBA (logical block address) numbers, which require BIOS support, chipset driver support, and operating systems support. Generally, you will need a BIOS with 48-bit LBA support (normally dated September 2002 or newer), the latest chipset drivers, and Windows XP with Service Pack 1 installed. The original version of WinXP—as well as Win2000/NT and Win95/98/ME—don't currently provide native support for hard drives that are larger than 137GB.

If you have a system without proper BIOS support, check with your motherboard manufacturer for an update. Optionally, you can use an add-in controller card with an onboard BIOS, such as the Ultra ATA 133 PCI card from Maxtor. If your motherboard uses a non-Intel chipset, check with the motherboard or chipset manufacturer for driver updates to enable 48-bit LBA support.

My CD-ROM/DVD drive doesn't work.

Optical drives are some of the more failure-prone components in a PC. It's not uncommon for one to suddenly fail after a year or so. If you're having problems with a drive that was newly installed, check the installation and configuration of the drive. Check the jumper settings; if using an 80-conductor cable, then, generally, the drive should be jumpered to Cable Select. If using a 40-conductor cable, then the drive should normally be set to either Master or Slave (depending on whether it's the only drive on the cable or not).

Check the cable to be sure it's not nicked or cut, and is a maximum of 18-inches long. Try replacing the cable with a new one or a known-good spare (use an 80-conductor cable if at all possible). Make sure the drive power is connected, and verify that power is available at the connector using a digital multimeter. Make sure the BIOS is set properly for the drive, and verify that the drive is detected during the boot process.

If the drive had already been installed and was working before, then first try reading different discs, preferably commercially stamped discs rather than writeable or rewriteable ones. Not all drives will read all discs.

My USB port or device doesn't work.

Make sure you've enabled the USB ports in the BIOS. Make sure your operating system supports USB (Win95 and NT do not, while Win 98 and later do). Try removing any hubs and plugging the USB device directly into the main USB ports of your system. Try replacing the USB cable. Many USB devices require additional power, so ensure that your device has an eternal power supply connected if one is required.

I installed an additional memory module, but the system doesn't recognize it.

Verify that the memory is compatible with your motherboard. There are many subtle variations on memory types that may appear to be identical on the surface (just because it will fit in the slot doesn't mean it will work properly with your system!). Check your motherboard manual for the specific type of memory your system requires, and possibly for a list of supported modules. You can visit www.crucial.com and use their memory selector to determine the exact type of memory for a specific system or motherboard. Also note that all motherboards have limits to the amount of memory they will support; many boards today will only support up to 512MB or 1GB. Again, consult the motherboard manual or manufacturer for information on the limits for your board.

If you're sure you have the correct type of memory, then follow the memory troubleshooting steps listed previously for intermittent memory problems.

I installed a new drive. It doesn't work and the drive LED remains lit.

This is the classic symptom of a cable plugged in backwards. Both ATA and floppy drives are designed to use cables with keyed connectors. However, there are cables available which lack this keying, which means they can easily be installed backwards. When the cable is installed backwards into either the motherboard or the drive, the LED on the drive will remain lit and the drive will not function.

While I was updating my BIOS, the system froze and now the system is dead!

This can occur when a flash ROM upgrade goes awry. Fortunately, most motherboards have a recovery routine, which can be enabled via a jumper on the board. When enabled, the recovery routine will normally cause the system to look for a floppy with the BIOS update program on it. If you haven't done so already, you'll need to download an updated BIOS from the motherboard manufacturer and follow the directions for placing the BIOS update program on a bootable floppy. Next set your motherboard for BIOS recovery mode via a jumper, power on the system, and wait until the procedure completes. It will normally take up to five minutes, and you may hear beeping to indicate the start and end of the procedure. Once the recovery is complete, turn off the system, restore the recovery jumper to the original (normal) setting.

If your motherboard doesn't feature BIOS recovery capability, then you may have to send the board to the manufacturer for repair. ■

Next month:
Windows Tips

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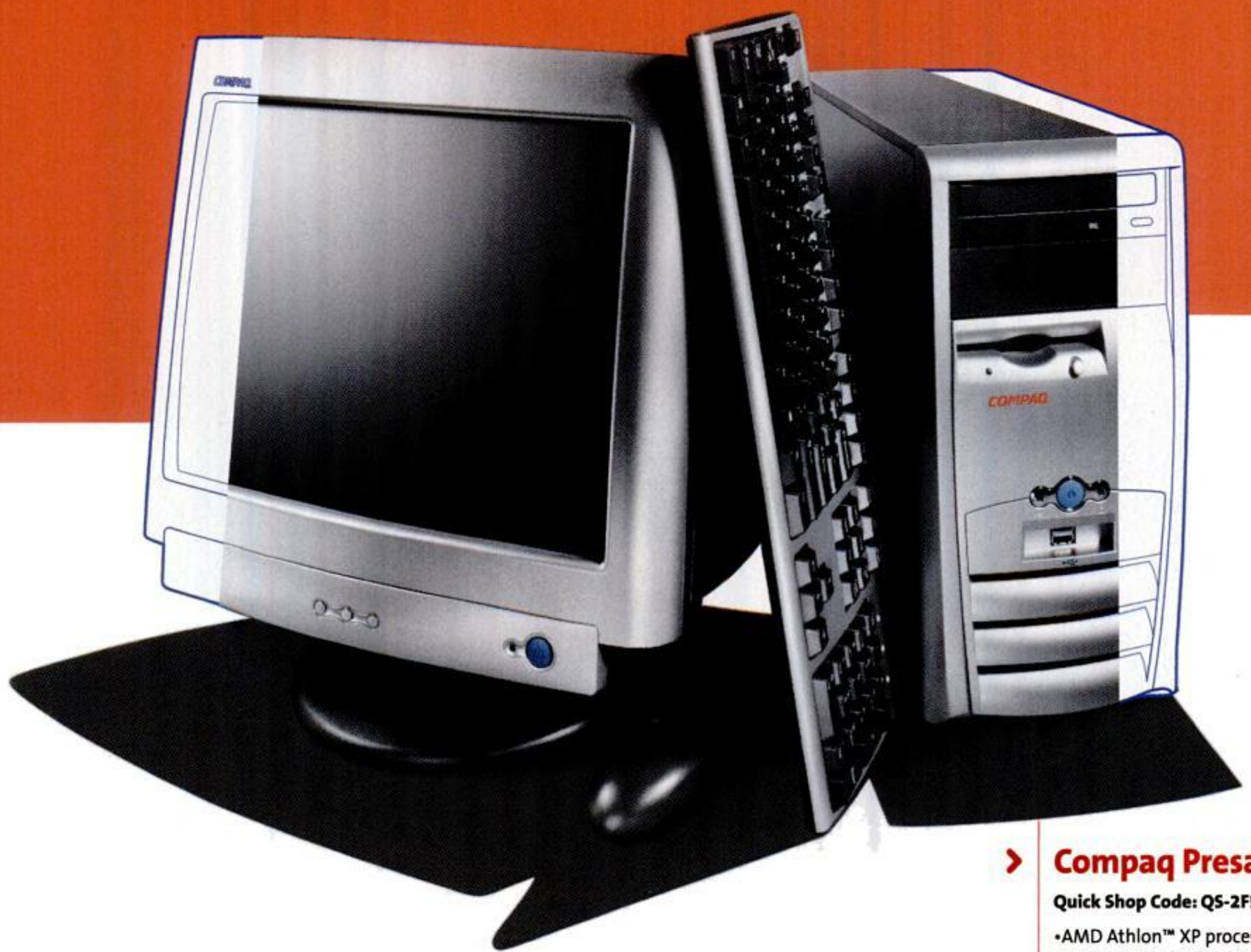

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Project PREDATOR

Alienware's bold new case design issues a direct challenge to case modders everywhere. But it's this prototype system's GeForce FX videocard that had us murmuring the most...

Intimidating. Sinister. Otherworldly. These are the words we uttered while uncrating Alienware's chilling new machine. But Alienware's new PC case isn't just an homage to H.R. Giger's creepy biomechanical artwork. It's also an in-your-face statement to PC enthusiasts: We might have morphed from a boutique manufacturer into a mainstream OEM, but we're still hardcore.

Our editorial staff hasn't done a hands-on preview of a prototype OEM machine since the days when the magazine was called *boot*. But when we saw Alienware's new case design, our hearts were all a-twitter. Then, when an Alien elder told us he'd stuff the rig with a working prototype version of the new GeForce FX videocard (a treasure no other system vendor could wrangle), we took the bait. "Give us that machine," whispered Jon Phillips in his Cigarette Smoking Man voice. "We must have it now."

We were happy to discover that Alienware's prototype was also outfitted with some very compelling peripherals—namely, a 30-inch LCD monitor that's actually suitable for gaming, and never-before-seen Klipsch 5.1 speakers. More about these parts in a moment. For now, let's focus on the case.

Alienware's new look has a lot to say about the direction of the PC industry. The aggressive design will certainly get a second look from little Timmy Masters when he's walking down the aisle of a computer store, but is it too badass for Timmy's dad? Maybe not. In an age when hanging sparklers from your CPU fan isn't considered outlandish, Alienware is on the front-line of an aesthetic movement that's sweeping the entire industry. What was once underground is now mainstream (see story on page 12). Even Best Buy and CompUSA are selling hardcore modding accessories, not to mention pre-fab PCs with flashy paint jobs.

Well aware that crazy paint schemes are becoming the norm for home enthusiasts, Alienware decided that a totally custom case body would be the best way to make a unique statement. Drawing from the work of H.R. Giger (whose artwork informed the set design of the *Alien* movie series), a third-party design firm began work on the enclosure, which was code-named "Predator." Many months and hundreds of thousands of dollars later, the new chassis was born.

Made of injection-molded ABS plastic (and not the excretions of the Hive queen), the new case maintains the functionality of Alienware's current case, and offers all the standard airflow and EMF safeguards. But it also comes with a few special modifications:

➤ The front door not only hides unsightly beige bezels, but also leaves a generous amount of room to tuck in an Audigy 2 Drive.

➤ No fewer than four USB 2.0 ports adorn the Predator's chin.

➤ The alien "eyes" actually function as air inlets for two fans tucked inside. A side blowhole and fan is cleverly integrated into one of the eyes to keep your add-in cards cool.

➤ An optional wire cage that attaches to the rear of the case lets you feed all your external cables through a central point to minimize clutter.

Alienware sent us one of its scarce prototypes for this story; the case itself won't be available for sale until late February. Like any CPU or video engineering sample, the prototype was rough and unpolished, but still provided a glimpse at how the company aims to maintain its street cred. After all, once you begin selling machines in Best Buy, you run the risk of losing your appeal among the hardcore elite.

Of this much we're sure: Very few do-it-yourself hardware hackers will ever be able to mod a case like this at home.

But what about the Alien innards?

Inside its prototype, Alienware included a mix of current and soon-to-be-released technologies. We were impressed—but not surprised by—the 3.06GHz Pentium 4, 512MB of PC1066 RDRAM, Audigy 2 soundcard, 48x Plextor CD burner, and Sony DVD burner (which can handle both –RW and +RW media). On the flipside, we were caught off-guard by the Serial ATA hard drive RAID array and 30-inch LCD flat-panel. As for our exclusive first gander at the nVidia GeForceFX in action, well, you can skip to page 40 for our reaction to *that*.

Because this machine was a prototype, we didn't pay much attention to its system-wide benchmark performance, which in some cases trailed that of the overclocked Totally Awesome machine reviewed on page 66

Finally, a front door that leaves enough room for an Audigy I/O drive.

Project PREDATOR

(the Alienware rig was neither overclocked nor tuned for performance). But playing with the prototype did give us a peek at technologies we expect to see more and more of in 2003:

➤ **Serial ATA:** For the most part, Serial ATA (SATA) has been more flash than substance. The new bus technology increases peak data throughput to 150MB/sec, paving the way for the future, when hard drives might actually be capable of bursting at such a high speed (today's drives rarely push the current parallel ATA ceiling of 100MB/sec). Nonetheless, SATA ushers in a new type of cabling that's thinner and less obtrusive, which should aid internal case airflow.

Alienware included two Seagate Barracuda V SATA drives running in a RAID 0 config care of an Escalade SATA add-in controller. The Baracuda drives hold 120GB a piece, spin at 7200rpm, feature 8MB caches, and run fluid bearings for quiet, reliable operation. We plan to cover SATA performance in greater depth in next month's "Speed Issue."

➤ **Klipsch ProMedia: GMX D-5.1 speakers:** We didn't get a chance to hear the non-working prototypes that you see in this article, but you can nonetheless appreciate that they're wicked-looking speakers! The new two-way satellites feature 3-inch metallized fiber cones and metallized horn tweeters, and can be adjusted to tilt 45 degrees in any direction (perfect for customizing your 5.1 sound field). A new 6.5-inch subwoofer features an enclosure design that Klipsch says is more efficient—and produces more bass—than the previous ProMedia 5.1 sub. Everything connects to a flying saucer–like control pod. To get the full 5.1 effect from the set, the speakers demand a digital SPDIF connection from your soundcard. The Creative Labs Audigy 2 and most other modern soundcards provide this connection, but you'll need the proper cable, which Klipsch will provide.

Priced at $299, the new GMX D-5.1s will inevitably be compared to the Logitech Z-680s, which were our favorite speakers of 2002. Expect to see the new Klipschies on retail shelves in February 2003.

➤ **NEC LCD3000:** At 30-inches diagonal, NEC's LCD3000 is currently the largest display to grace our Lab, and for just $4,300, it's practically a steal. Big LCD panels tend to be a little dark, especially around the edges, but the LCD3000 is incredibly bright for such a behemoth. The real story behind this display, though, is its 1280x768 native resolution. For a piece of glass this large, we'd expect 1900x1200.

OK, so you don't get super-high resolutions, and pixel pitch is relatively coarse at 0.500mm (a typical 18-inch display clocks in at 0.280), but what you *do* get is a native, non-interpolated screen that could be more suitable for 3D gaming than many smaller LCDs on the market. Think about it: How slow would most of your games run at 1600x1200, let alone a higher resolution? By offering pristine DVI output at a humble resolution, you get to play your first-person shooter with zero fuzzy interpolation on a gigantic, immersive screen. The caveat is that most games don't support 1280x768, so they'll run stretched at 1024x768, or just run with blank bars on either side at 1024x768. Brief Lab testing impressed us, and we saw no unseemly pixel lag (which is pretty much a thing of the past with today's best LCDs). We'll provide an in-depth review of the LCD3000 in a future issue.

Finicky PC enthusiasts will run all their cables through Alienware's centralized cable caddy.

We don't know how the new Klipschies sound, but they *look* like perfect complements to the Alienware rig.

The Next Step

Dissecting the Predator prototype was like visiting a mini trade show—it gave us a brief glimpse at must-see technologies. But we all know that the main attraction of Alienware's component load-out is the GeForce FX videocard. Turn the page for our preview benchmarks of beta silicon and drivers—a *Maximum PC* exclusive.

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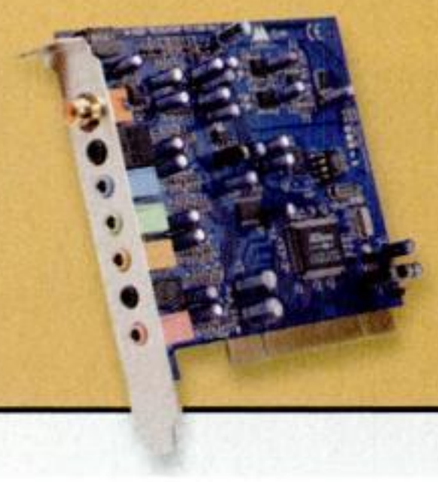

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EXCLUSIVE!

We preview nVidia's latest 3D wunderkind and handicap the inevitable battle with ATI

nVidia's massive new cooling apparatus—which includes a crazy radiator and fan covering—blocks your first PCI slot.

We first heard about the GeForce FX, then code-named NV30, in June 2002. We received a run-down of its feature set—pixel and vertex shaders that exceed the DirectX 9 spec, 128-bit floating-point precision throughout the 3D pipeline, and support for DDR II memory—but weren't able to finagle access to working silicon. *Until now!*

Of course, the GeForceFX card that came inside the Alienware prototype was just as "beta" as the rest of the system. With early drivers and freshly fabbed silicon, the card we tested isn't quite what you'll find in stores when the card ships in February or March. In fact, the board and its drivers were so unpolished, nVidia initially refused to let us benchmark it at all, and relented only when we agreed to limit our tests to pre-approved benchmarks running at stipulated resolutions and AA settings. We gave in to all these conditions because we were intent on reporting the first GeForce FX benchmark scores, however beta they may be. Driver refinement is an ongoing process—before and after a videocard launch—and frame rates will improve as nVidia optimizes for specific engines.

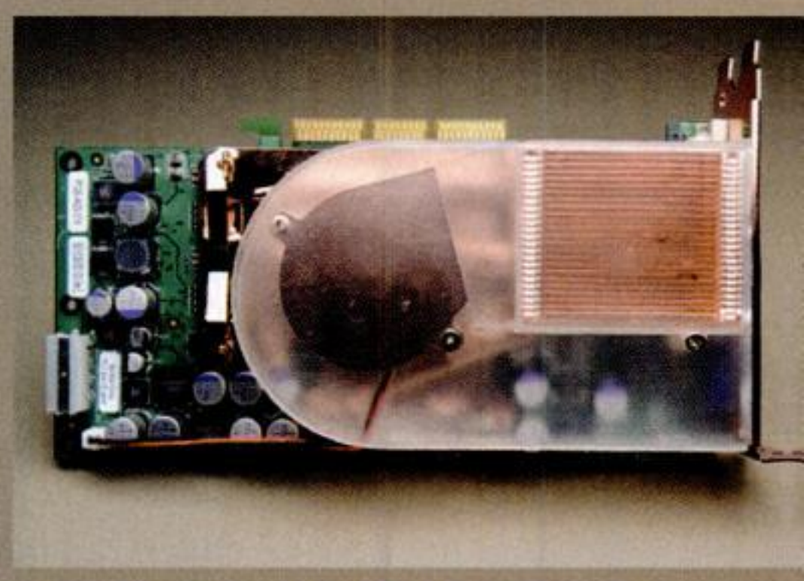
It would be silly to extrapolate fine details about the card's performance from such a small benchmark sample. It would also be unfair, considering the un-optimized condition of the drivers. But we can make some broad guesses about the strengths and weaknesses of nVidia's new technology. In *Quake III* running at 1600x1200, 32-bit color and 2x anti-aliasing, the GeForce FX is about 40 percent faster than the ATI Radeon 9700 Pro at the same settings. The GeForce is almost 20 percent faster than the 9700 Pro in the *Unreal Tournament 2003* Asbestos fly-by demo at these same settings. However, in the *3DMark 2001:SE* Game 4 benchmark at these settings, the Radeon 9700 is about 10 percent *faster* than the GeForce FX.

What does this suggest? That the GeForce FX is very fast—particularly when memory bandwidth isn't an issue. Remember that the GeForce FX's 128-bit memory bus runs at 500MHz, but has a maximum bandwidth of just 16GB/sec. Meanwhile, the Radeon 9700's 256-bit memory interface accommodates 19.8GB/sec, even though it runs at just 325MHz.

The GeForce FX's core graphics processor is much faster than the Radeon 9700's, so it will be able to draw as many polygons and fill as many pixels as will fit across the memory pipeline. Our hunch is that turning on 4x anti-aliasing at 1600x1200 would diminish the GeForce's performance lead over the Radeon, or maybe even nix it entirely. But that's just a guess based on the scores we achieved, and the fact that nVidia wouldn't let us run anything that would stress the memory pipeline.

We are much more surprised by the Game 4 scores. We expected to see the GeForce FX's 500MHz core flex its programmable-shader muscle in this DirectX 8 benchmark. nVidia says that the FX's programmable shaders are able to run more complex shader programs than those mandated by the DirectX 9 spec. Our guess is that the nVidia drivers just aren't tuned for this particular benchmark yet.

The practical upshot is that if next year's games—specifically *DooM III* and its programmable-shader brethren—require more raw GPU power than sheer memory bandwidth, the GeForce FX architecture will be a perfect fit. On the other hand, if next year's games are starved for memory bandwidth, the Radeon 9700 could very well be a better choice for frame rate–hungry gamers. This is just the first round, though. We have no doubt that ATI has plans for a souped-up Radeon that will be ready to roll as soon as the GeForce FX ships. And if you really twisted our arms, we'd bet money that it will be running on a 0.13-micron core and using 256-bit DDR II memory. ■



Just barely visible in this shot are three copper rods that transfer heat from the GPU and memory to the radiator.

DARE to COMPARE: GeForce FX Early Benchmarks	Quake3 Demo 001 1600x1200 2xAA	UT 2003 Asbestos 1600x1200 2xAA	3DMark Game4 1600x1200 2xAA
GeForce FX beta	209 fps	140 fps	41 fps
Radeon 9700 Pro	147 fps	119 fps	45 fps

NOTE: Tests were run in the Alienware prototype system.

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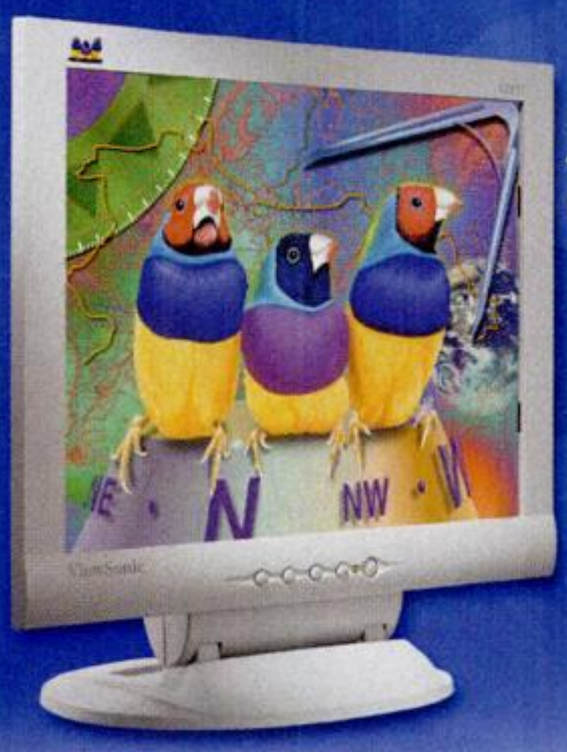

Beige

Black

Metallic

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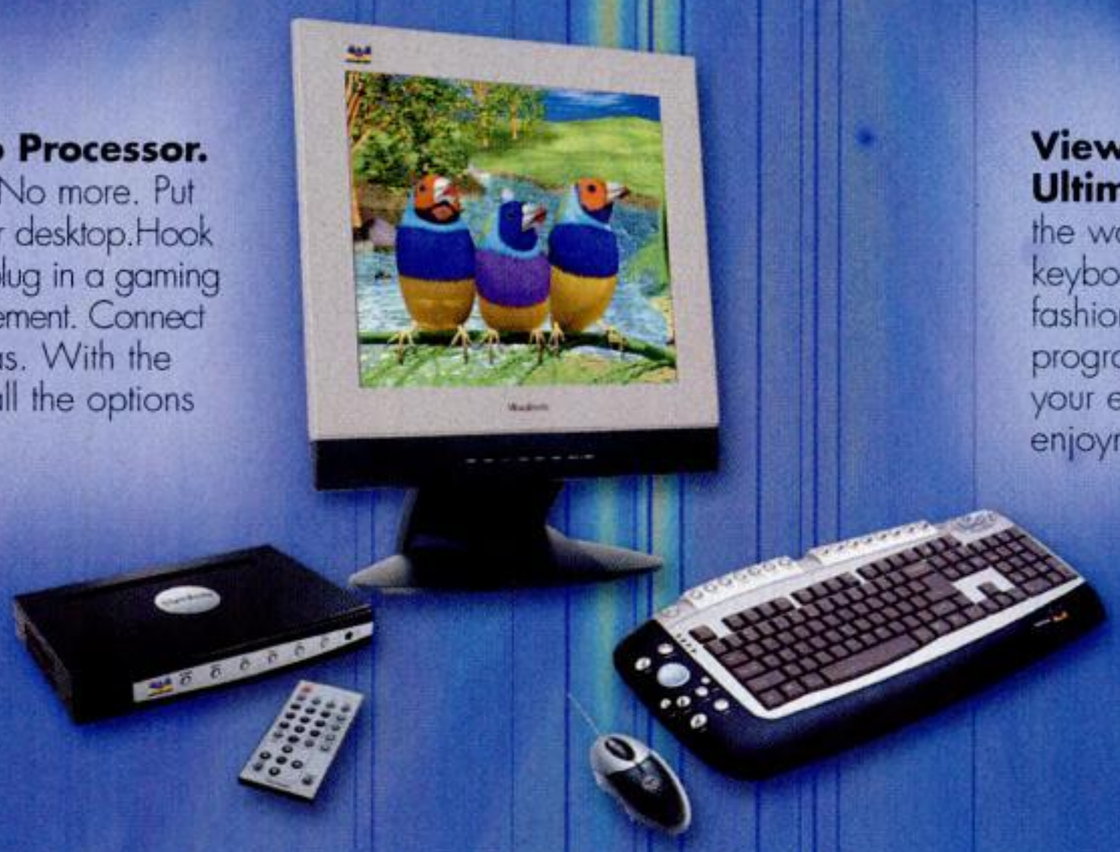

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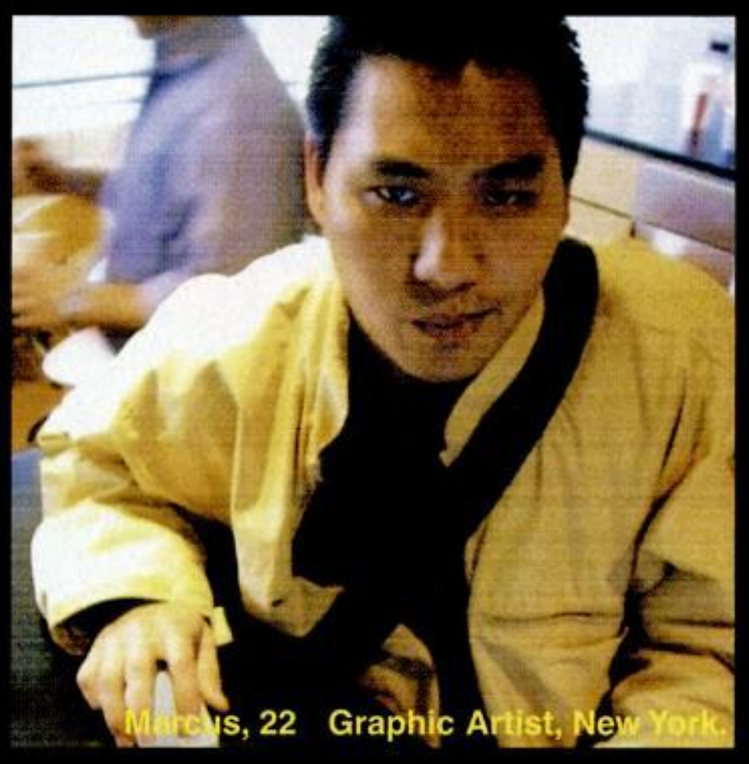


Bambito: It looks a little ridiculous, but pound for pound, the best aquatic fighter is definitely the Sharkantis...

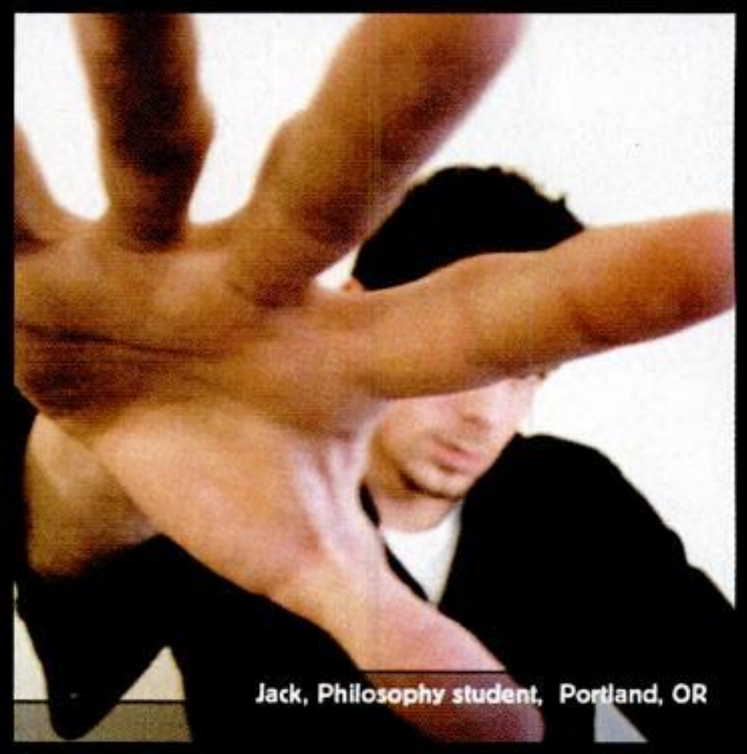
That's right. Take a shark and breed it with a praying mantis.

Trust me. This thing will knock you out and bite your ear off.

Jack B. Quick: Shark Shark Shark.

If I hear another shark combo, I'll puke. When it comes to fighting in the water, the word "attrition" comes to mind. It's a numbers game.

I like to load up on piranhas and put them with a fast predatory feline. When you got an army of Piranha Tigers, you'll be King Neptune faster than you can say "Mermaid Sandwich." Get my drift??? ;-)



Violence
Comic Mischief

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Traceydoll: Ok sharks are good, but why mess with bugs when you can take something vicious and mix it with straight-up nastiness. Give me a hammerhead shark and a crocodile and I'll show you a mean machine.

In a 30 min. fight to the death, it's sink, swim or be devoured.

Looks like Jack B. Quick may be in for a nice and slow death. You hear me, Jack? You got nothing!

Tracey, 18 Wicked Bad Photographer, Boston

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The cylindrical Tank-O-Matic (center) is the centerpiece of Innovatek's cutting-edge water-cooling kit.

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COOLING

Hardcore overclocking requires high-tech chill, so let's get frosty with four cutting-edge cooling systems

Few home users ever had to worry about case cooling in the old x86 days. CPU speeds were measured in megahertz, and videocards sat around exposed in their underwear while drawing simple 2D graphics. But not anymore: 3GHz procs, 7200rpm hard drives, and massive videocards have pushed us into a new era of global PC warming. Without proper cooling, your PC won't last much longer than you would trekking through the Sahara in a snow parka.

If you've overclocked your CPU and videocard, the situation is even more critical—a few fans pushing around lukewarm air may not be enough. Without some adequate method of dissipating the heat, you'll get frequent crashes, or, even worse, a complete frizzle-fry of your key components.

What you're looking for is the kind of extreme heat dissipation that only water and phase-change cooling systems provide. These kits transfer performance-sapping heat away from your PC's vitals using technologies more commonly found under the hoods of cars and in supermarket freezers. For example, a chip that normally runs well over 100 degrees can be cooled to room temperature using a water-cooling kit. Meanwhile, a phase-changer can drop temperatures to below freezing.

But cowards need not apply. Exotic cooling can be messy and difficult to implement, and often costs more than the CPU you're trying to chill. Even worse, one wrong step can destroy your system. Still, if you're already handy inside a PC and brave enough to face the danger, you're almost guaranteed to have the coolest machine on your block. We begin our tour of the arctic circle with a look at how two extreme technologies work, and then finish it off with reviews of four outrageous systems.

—BRIAN LAM

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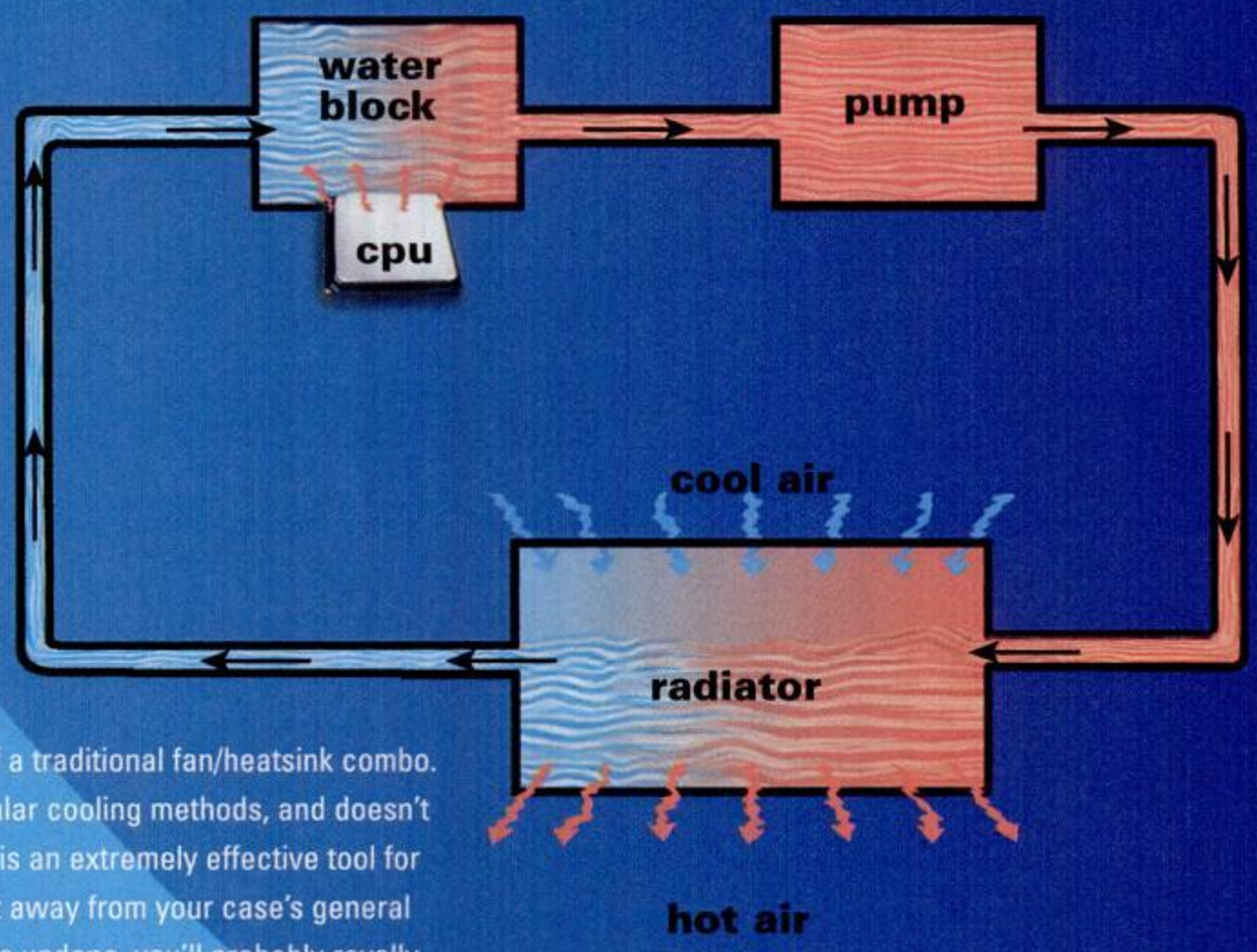
eXtreme COOLING

How Water Cooling Works

It's like a little splash of Evian for your PC

Water-cooling systems send liquid to "heat blocks" attached to your key components (candidates include your CPU, GPU, and hard drive). The cool liquid draws heat away from your searing component, then flows to some type of cooling device (usually a fan-cooled radiator), which dissipates the heat outside of your case. The liquid is circulated through each heat block with the help of a pump—the literal heart of the water-cooling system. This ticker, usually a high-end fish tank pump, can pump thousands of gallons a day throughout your rig.

The water within a heat block can absorb four times the heat of a traditional fan/heatsink combo. Even better, it can transfer heat 30 times more effectively than regular cooling methods, and doesn't produce an excessive amount of fan noise. In short, water-cooling is an extremely effective tool for overclockers—it not only cools key components, it also keeps heat away from your case's general interior. Just be aware that if one of your circulation tubes becomes undone, you'll probably royally bork your system.



How Phase-Change Cooling Works

Simple physics for cooler CPUs

A "phase change" occurs when matter shifts between any of its liquid, gaseous, or solid states. For example, water phase-changes when it turns to ice in your freezer, when it boils away in a cooking pot, and when steam condenses back into water.

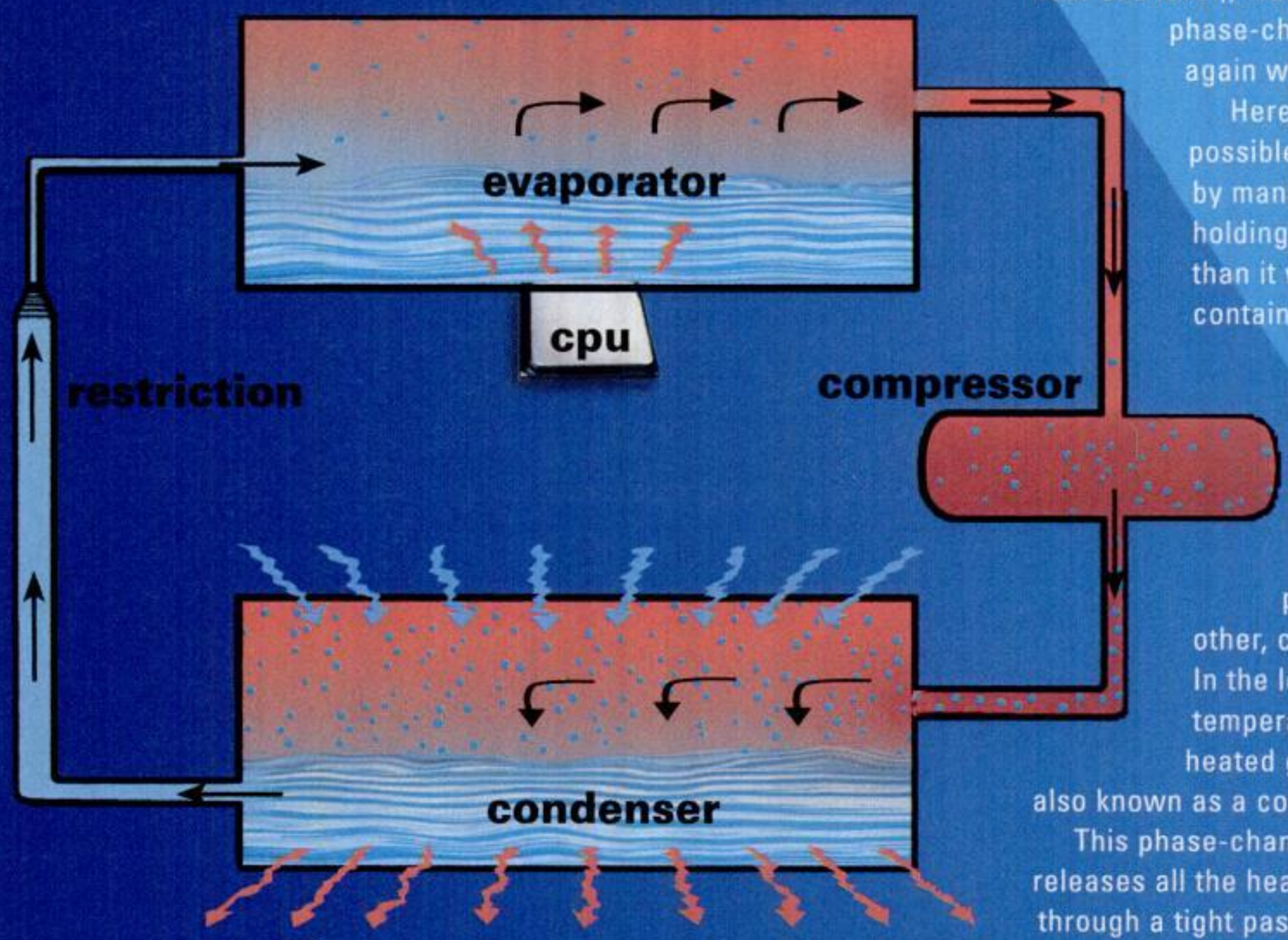
In order to change from liquid to gas, water (like all matter) needs a significant amount of energy. At room temperature, for example, one gram of water needs just one calorie of energy to increase in temperature by 1 degree Celsius. But at 100 degrees Celsius (the boiling point of water near sea level), water needs to absorb 540 times that amount of energy to phase-change into steam. Conversely, all that energy is released again when the steam vapor condenses back into a liquid.

Here's the plot twist that makes phase-change cooling possible: Boiling and condensation can be forced to occur by manipulating pressure, and if you put water in a container holding a vacuum, the water will boil at a lower temperature than it would at regular room pressure. Water in this vacuum container still requires 540 calories of energy to convert to steam, and it will absorb this energy from the most convenient heat source—such as a scorching CPU.

Fantastic, yes, but true: By boiling refrigerant over your CPU—and "stealing" its heat energy to do so—the processor is cooled.

In a phase-change system for your PC, a compressor sucks air from one side of the system to the other, creating a low-pressure side and a high-pressure side. In the low-pressure side, boiling is induced at extremely low temperatures in a chamber called the evaporator. Once the heated gas moves out of the vacuum, an air-cooled radiator—also known as a condenser—causes the gas to turn to liquid again.

This phase-change from gas to water—known as condensation—releases all the heat that's been drawn from your CPU. The liquid passes through a tight passage called a restrictor, which keeps the low-pressure and high-pressure sides separate.



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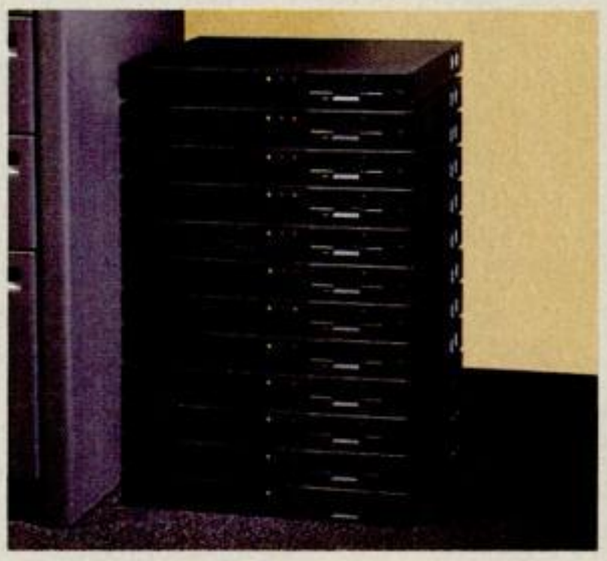

SleekLine computers offer a centralized solution for crowded office cubicles. Reclaim valuable working space by replacing up to 12 mid-towers with a 2 sq. ft. stack of space-saving SleekLines.

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extreme COOLING

Innovatek InnovaSET3

Water-cooling-cum-industrial art

The Innovatek water-cooling kit is an elegant solution to CPU cooling problems. Each of the kit's simple components—from the cylindrical reservoir to the stocky heat block—are functional works of art and look absolutely stunning when viewed through a case window. Although the Innovatek was the least effective cooling kit of the roundup, its resulting CPU temperatures were still leagues below those of traditional cooling methods, and the kit's design is both bulletproof as well as breathtaking.

Once the kit is installed and running, heat is pulled from your CPU and enters the water stream via the InnovaCOOL Revision 3 heat block. The hefty, 11-ounce heat block is made of a solid copper core welded to an aluminum shell, and similar blocks are available for your GPU and hard drives. Exiting via 8mm tubing, heated water gets dropped off into the giant 280ml reservoir, dubbed the Tank-O-Matic. We loved the Tank-O-Matic's ability to strand bubbles in the top of its chamber, rather than letting them re-enter the stream, which reduces cooling efficiency. Before returning to the sluggish-but-quiet 1046 Eheim pump (rated for 78 gallons per hour), the heat is transferred from the water into the air via the kit's aluminum/copper Maxxtor radiator and 120mm fan.

Innovatek uses the most secure hose clamp system we've ever seen in a water-cooling kit—a nice safeguard against menacing leaks. The chrome O-rings held on to the kit's polyurethane hosing like a pitbull attached to a mail carrier's ankle.

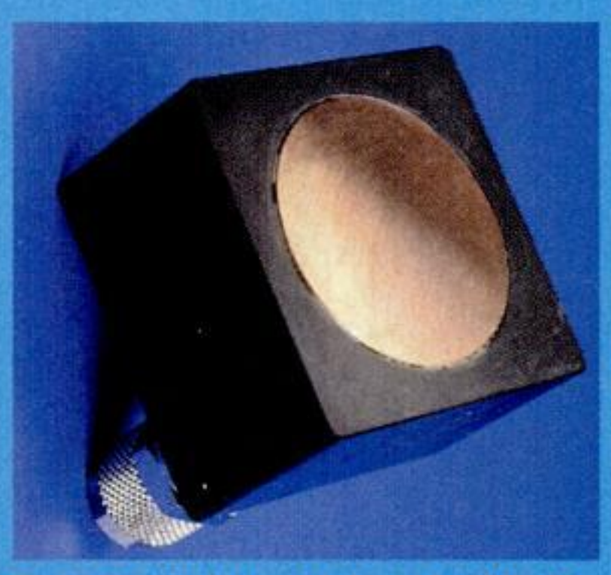
Using an Asus P4S8X mobo and an unlocked 2.8GHz Pentium 4, the kit beat the stock fan/heatsink combo by 20 degrees Fahrenheit during 100 percent CPU usage. Sitting pretty without breaking a sweat, the Innovatek kit allowed us to gain nearly 500MHz over the stock speed. In short, we reached a stable 3287MHz at just 93 degrees.

The kit's installation was perfectly straightforward, though the users manual lacks polish. And unless you purchase the optional relay kit, the pump must be turned on manually (instead of automatically turning on during normal system power-up).

The hardest of hardcore overclockers will be disappointed by the kit's cooling prowess. Upgrading to the optional large pump and radiator will help achieve lower temps, but we'd prefer it if the premium parts were standard issue. Nonetheless, a 500MHz overclock is quite substantial, especially for a contraption that's near-silent during full-bore operation. The Innovatek is also the prettiest and sturdiest exotic cooling kit in the roundup, and this is what helped it win Gear of the Year honors in our December 2002 issue.

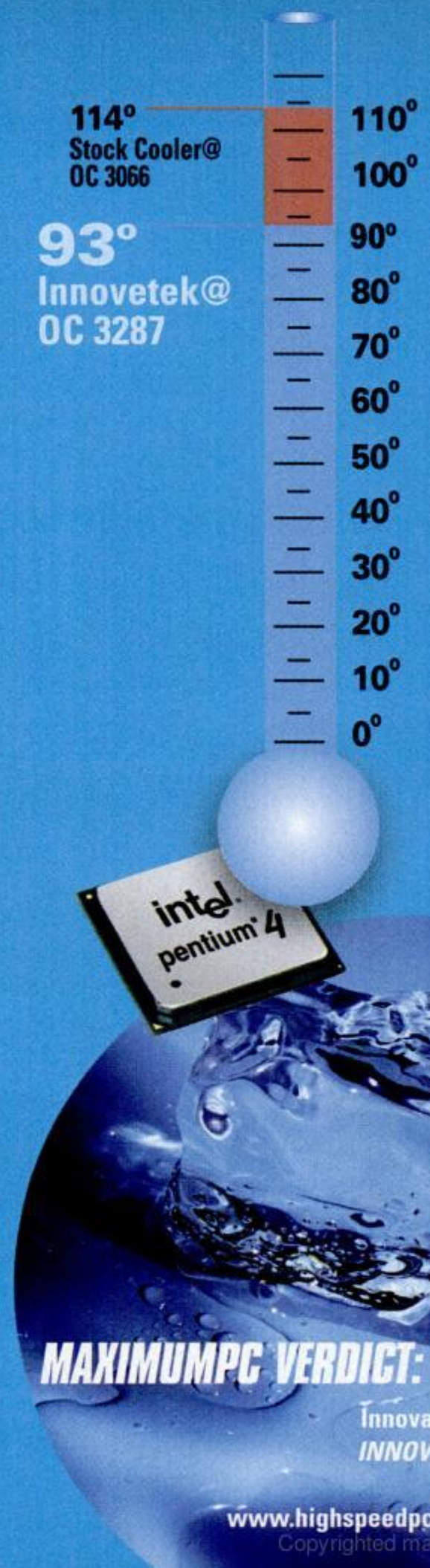
The Mercedes Benz of water-cooling kits.

With its removable top, this reservoir makes filling the kit easy.



The stocky Innovatek water block is part aluminum, part copper, and 100 percent high-quality.

Innovatek hose clamps: It doesn't get any sturdier than this unless you pull them off a fire truck.



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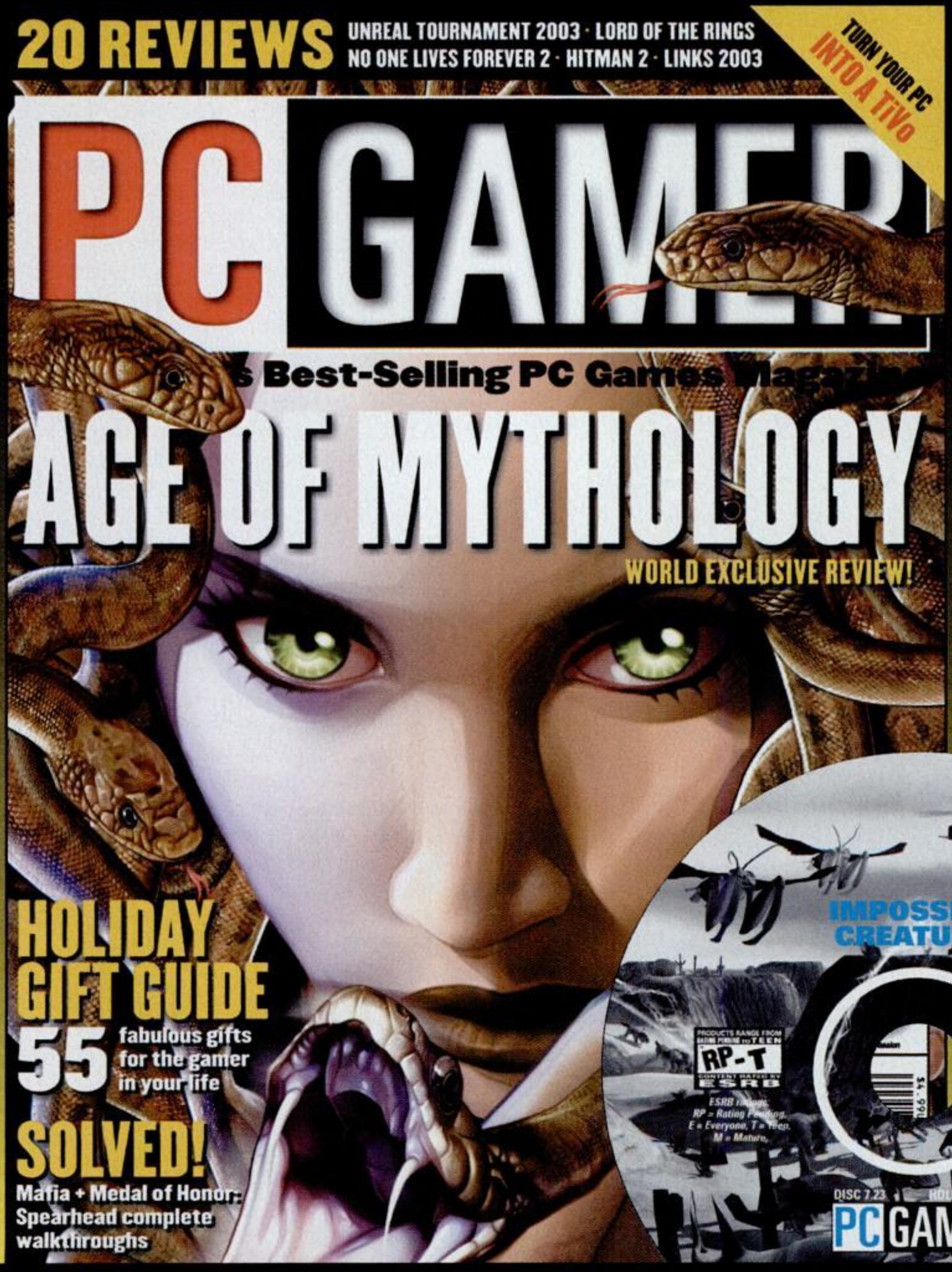

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EG23MAX1Y

eXtreme COOLI

Koolance Exos

High-performance water-cooling, but bland and slightly worrying

Back in the day, Koolance water-cooling systems always came preconfigured and permanently integrated into clunky Koolance cases. The Exos kit, however, gives you all of Koolance's water-cooling technology without the bland Koolance shell. Although some of the Exos parts would have been more impressive if made from aluminum rather than plastic, we can tell you that the kit's build quality is better than what we tested in earlier Koolance cases. Perhaps even more importantly, the Exos was the best-performing water-cooling system we've ever tested.

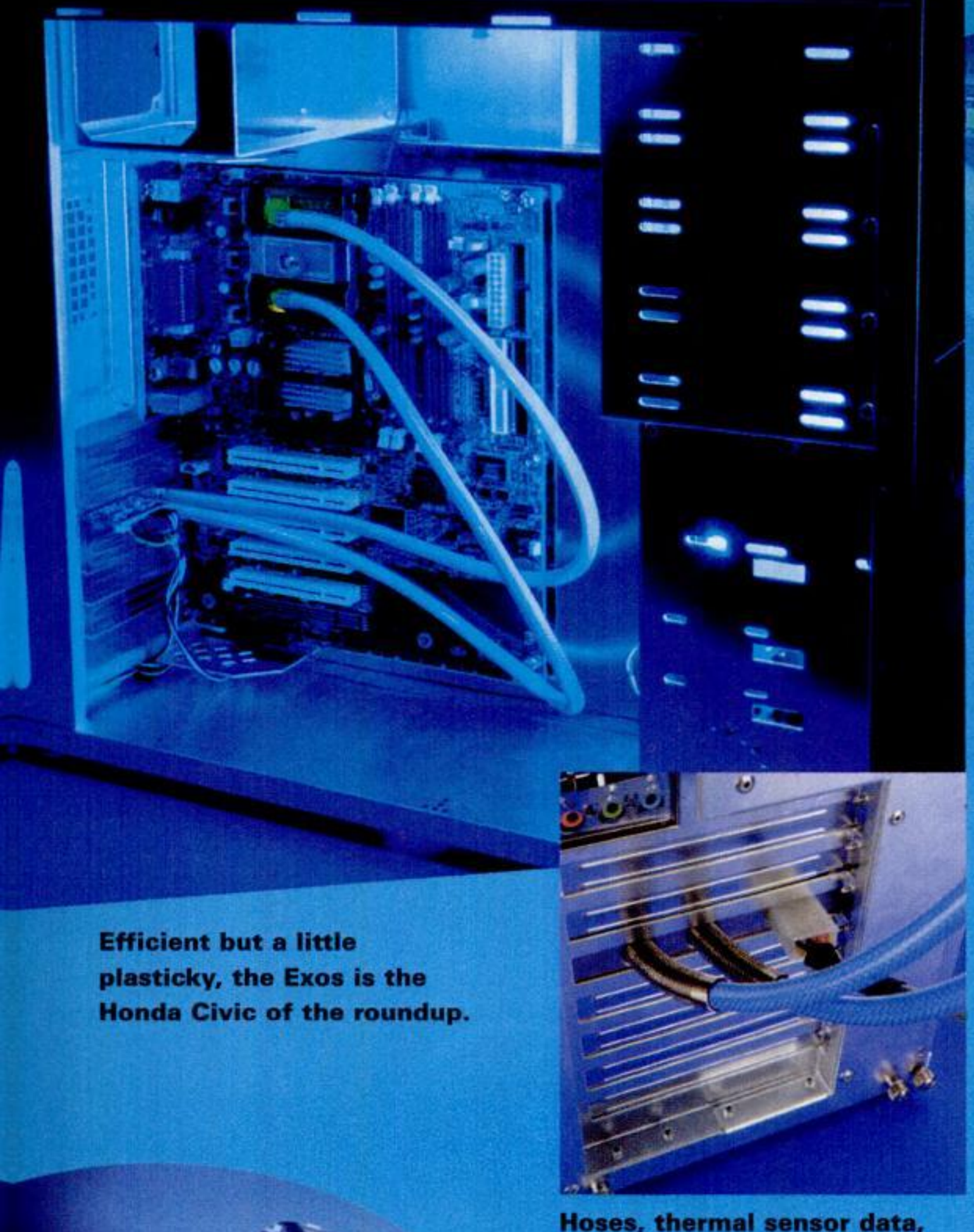
The kit's entire functional system is housed in an external unit that's home to a Koolance fan control unit, dual custom-built submersible water pumps, and three 80mm fans perched atop a radiator. The only thing not residing in the external unit is the Koolance CPU heat block. Inside the block, an intricate pyramid pattern works to maximize surface area (like myriad fins on a heatsink), and transfer heat from the CPU to the system's fluid system. Water passes from the heat block to the outside unit and back again via a clever PCI slot cover modified with holes for water tubing. Alongside the tubing, a cable carries thermal diode information and a 12-volt rail to juice the Exos's pumps and fans. The entire kit is powered up and down with your PC.

We cranked the fans from the temperature-controlled quiet mode to the maximum setting, fired up *CPU Burn In*, and pushed our P4 to a stable 3333MHz over the stock 2.8 GHz rating. At a full CPU load, the Exos kept the chip below 82 degrees. That's well below fan-cooled temperatures, and even 10 degrees below what was mustered by the Innovatek kit. We suspect that at least a portion of the extra chill comes from the heat block's 21K gold-plated mirror finish, which transfers heat extremely efficiently.

In the water-cooling business for eight years, Koolance has a mature product that's ready to be integrated swiftly and easily into any system. The only downside is that many of the components—including the cheap clamps and plastic-topped heat block—feel flimsy and don't inspire confidence. Still, this black box keeps the heat outside of your case, where it belongs.

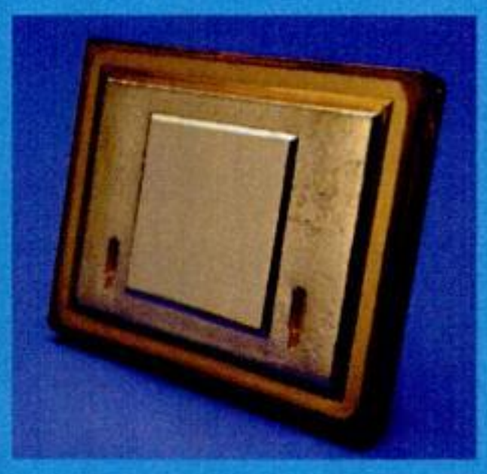
Indoor plumbing: As cool as an autumn day. PCI hose and cable pass-through eliminates the need for drilling.

Outhouses: Cheap clamping system and plastic water-block top had us worried.

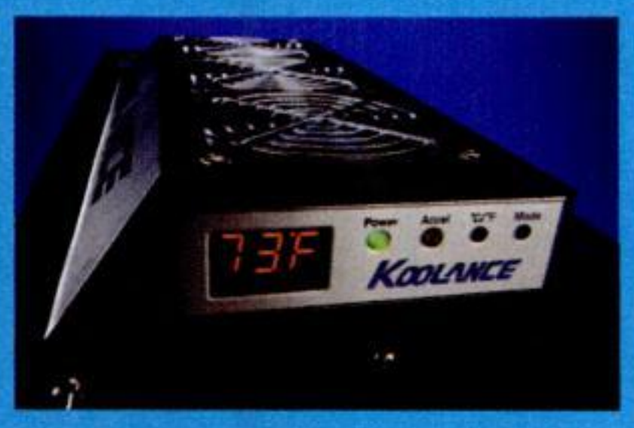


Efficient but a little plasticky, the Exos is the Honda Civic of the roundup.

Hoses, thermal sensor data, and power are delivered via a PCI pass-through.



Gold-plated bottom, plastic top. This odd juxtaposition of building materials transfers heat efficiently.



Three fan presets control the whirling array in the background: Cool, colder, and funky-freeze.

MAXIMUMPC VERDICT: 9

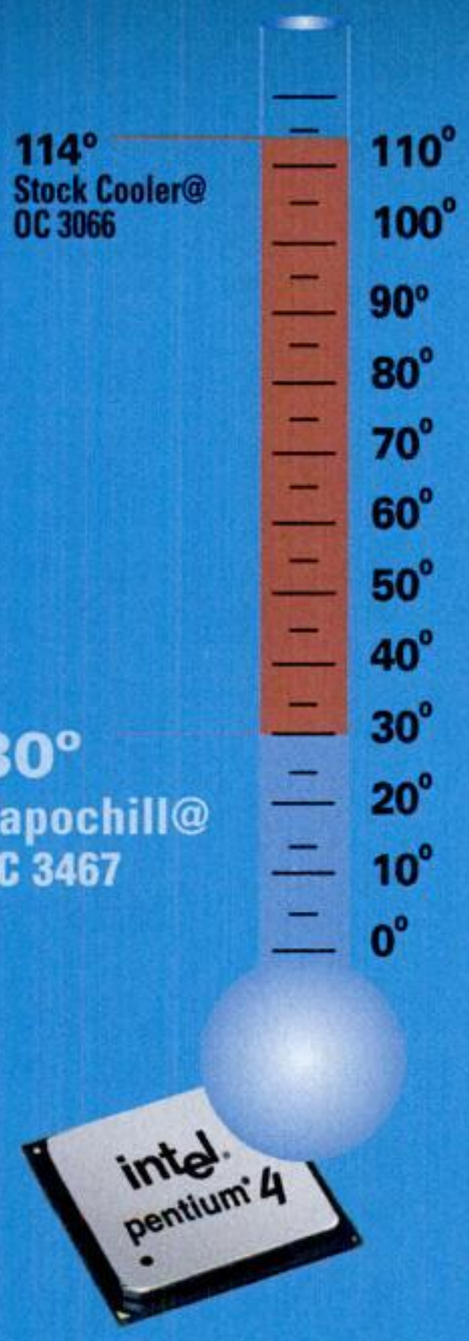
EXOS
KOOLANCE
$315
www.koolance.com

Vapochill Professional Edition

Sub-zero—but also sub-par

In Europe, Vapochill phase-change systems are OEM components in professional CAD and video workstations. The technology is quiet, efficient in its power consumption, and has alarms for component failure. The Vapochill is also reliable enough for so-called "mission critical" work environments—but a poor head-mount design and second-best cooling ability keep it from being tops in this roundup.

The Vapochill PE comes pre-installed in its own case. We hope you like the way it looks, because you won't be transplanting this baby into that aluminum case you had your eye on. Inside, the 12-volt compressor and condenser are located in the top quarter of the case, sealed away in their own chamber.



Meanwhile, the control unit and evaporator cooling head share a space with the rest of your PC's components. During installation, we surrounded the CPU with the bundled foam, heated insulators, and nonconductive goop to ward off condensation (a messy but effective way to prevent ice-crystal formation during forays into sub-freezing temperatures). Next, we screwed down the very shaky clamping system. This thing would probably be a nightmare for owners of the notoriously fragile Athlon XP, as there's no way to ensure the cooling head is placed evenly (let alone safely) on your processor. Even with our P4, we weren't confident that the head was set evenly.

The Vapochill machine is otherwise an efficient system—so efficient that it runs off of the power from your ATX power supply. Yes, that means sub-freezing temperatures from the same power supply that would otherwise be running your noisy fans. Powered up, the Vapochill waits until its phase-changer has reached effective temperatures before firing up your PC—usually about 45 seconds, and a small price to pay for overclocking goodness. When all was said and done, our stock 2.8GHz P4 hot pocket became a 30 degree Fahrenheit bon bon at 3487MHz.

While the Vapochill performed admirably in the Lab, our overall Vapochill experience was less than pleasing. We didn't like the photocopied manual, the gooey installation, or the dubious clamping solution. But if you really want to keep an eye on your electricity bill, and you just have to have a cooling system your European friends will be jealous of, go for it.

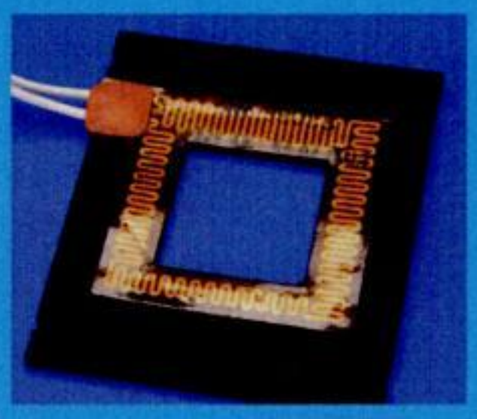
Ice cream: Sub-freezing temps from your ATX power supply.

Ice milk: Can't use your own case, and the clamp-design along with other niggling design issues left us unimpressed.

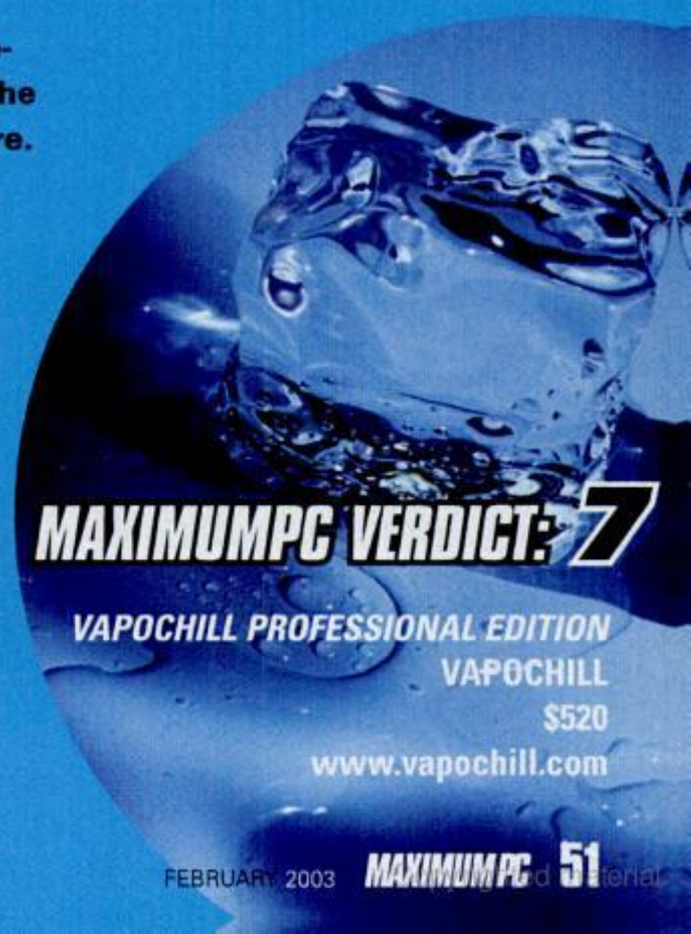
The controller circuit reports temperatures, manages the phase-change system, and shuts down the PC in the event of a cooling failure.

The Vapochill's fatal flaw is a mounting device that doesn't ensure even contact with your CPU.

The latest VapoChill is cooler and cheaper than ever—and it all runs off a standard ATX power supply.



The heating element fights condensation, the bane of all extreme cooling technologies.



eXtreme COOLIN

It cools so well, we'd swear it was designed by, you know... *them*.

MAXIMUM PC KICK ASS PRODUCT

Chip-Con Prometeia

The coldest tower of power

Standing tall and proud, the Prometeia full tower reminds us of the mysterious black monolith in Kubrick's *2001*. But the Prometeia's real claim to fame is its power—indeed, it's the most powerful mass-produced PC cooling-system ever built.

How's this for starters: Minus-40 degrees Fahrenheit. Yes, that was the temperature reported by the Prometeia's internal diode (which samples the maximum cooling available when unattached to a CPU). We won't debate the accuracy of the Prometeia's onboard temperature reporting, but we can confirm that this thing runs Ice Age cold. After overclocking our CPU and running it at full steam, we were able to hit 3600MHz at 5 degrees Fahrenheit. That's the coolest and fastest PC we've ever tested at *Maximum PC*, bar none.

These numbers are none too surprising considering that the compressor is about the size of a small cannonball, forming a powerful evaporation-inducing vacuum. In fact, it's so powerful, it needs to run off its own power brick, pulling 200 watts at full bore. Thankfully, it does all this intelligently: By piggybacking the reset and power signals from the front of your case, the Prometeia knows when to cool and when to go to sleep. What's more, the cooling head's even surface transferred heat efficiently, even though it was a bit off-center when mated with our P4.

The Prometeia has the polish to go along with its performance, too. This is no hobbyists' chop job. The manual is well written and complete with 3D illustrations, and putting the kit together is easy, thanks to a fool-proof head clamping system. Even working with the sealing putty that protects against condensation build-up was painless—it looks goopy, but it comes off clean. All the temperature and fan controls are adjustable via a front-mounted LCD display, and no extra software is needed.

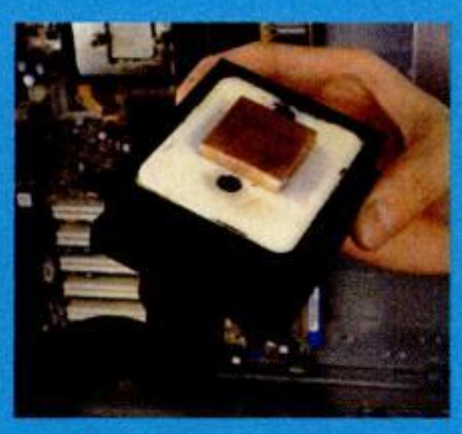
Everything important to the cooling system sits in a box that sits underneath the main chassis. So if you were determined to swap cases, all you would need to do is drill a few holes for the mounting bolts and evaporator head cables.

The Prometeia was easier to work with than the Vapochill, and feels more professionally built. They say it was designed in Denmark by the folks at Chip-Con, but we suspect it was built by an advanced alien race.

Zeus: Cold. Really cold. Like Antarctica.

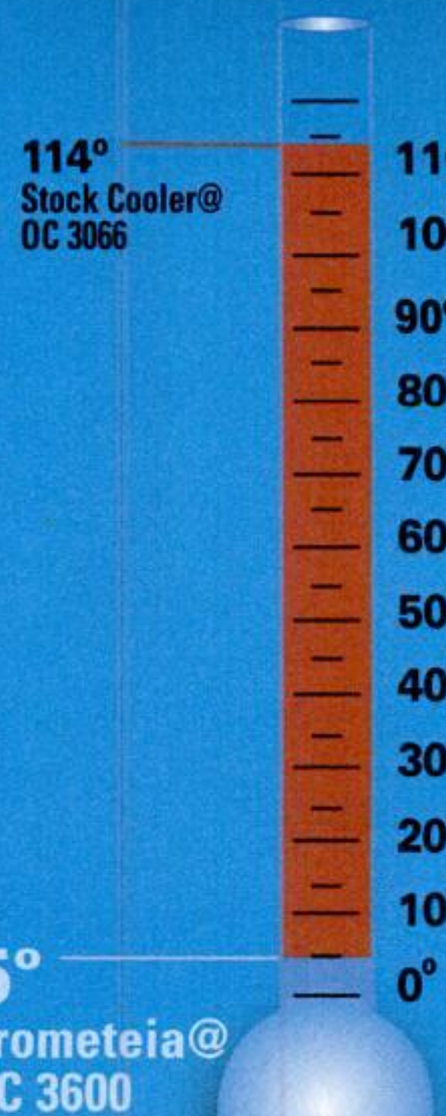
Hades: Expensive. Very.

The Prometeia's humongous compressor makes über-cold temperatures possible.



Locked down by two spring-loaded bolts and smoothly finished, the evaporator head mates snugly with your CPU.

The LCD panel serves double-duty by reporting temperatures and providing an interface for adjusting cooling settings.

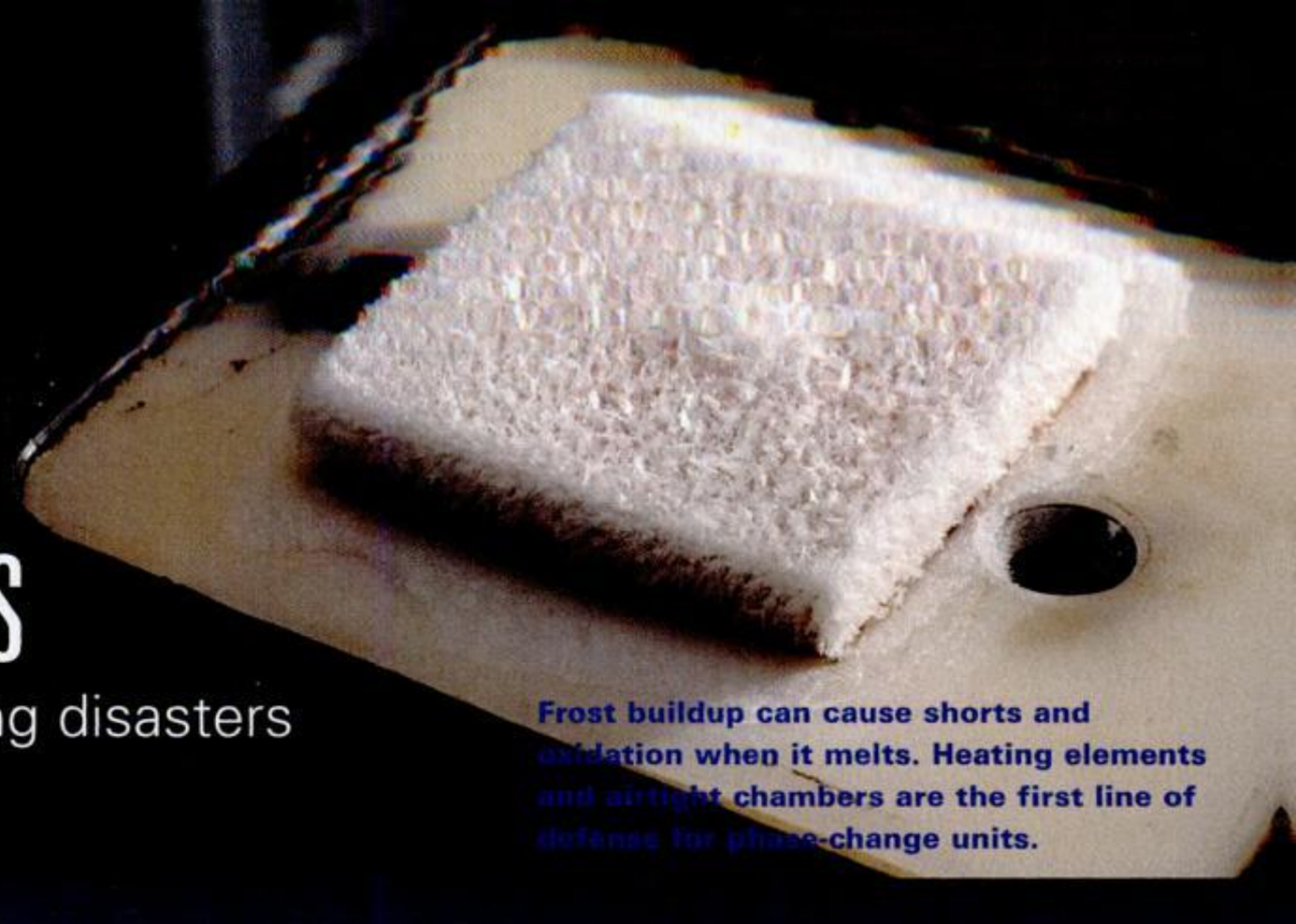


MAXIMUMPC VERDICT: 9

PROMETEIA
CHIP-CON
$700
www.prometeia.com

It's Cool to be Cautious

Helpful tips to prevent extreme cooling disasters



Frost buildup can cause shorts and oxidation when it melts. Heating elements and airtight chambers are the first line of defense for phase-change units.

Crack, drip, glug. Snap, sizzle, pop. That's the sound of $3,000 worth of PC hardware flushing itself down the drain because of a water-cooling system leak. If you're going the water-cooling route, take the following precautions to avoid hearing the PC death rattle…

♦ **A clean start:** Use distilled water. Distilled water, unlike bottled water and tap water, is nearly devoid of caustic minerals. It's also free of aquatic life, which can spawn in the hospitable heat of your water-cooling soup. You're trying to build a cooling system, not a swamp. And of course consult the maker of your kit for advisories on any possible water additives, such as bleach, antifreeze, or Goldschlager.

♦ **Fill it, don't spill it:** Measure all your tube lengths inside your PC, but fill your kit outside of the case. This will prevent accidental motherboard irrigation. Use a funnel—or even a clean paper cup with a slot cut in the lip—for pinpoint pouring.

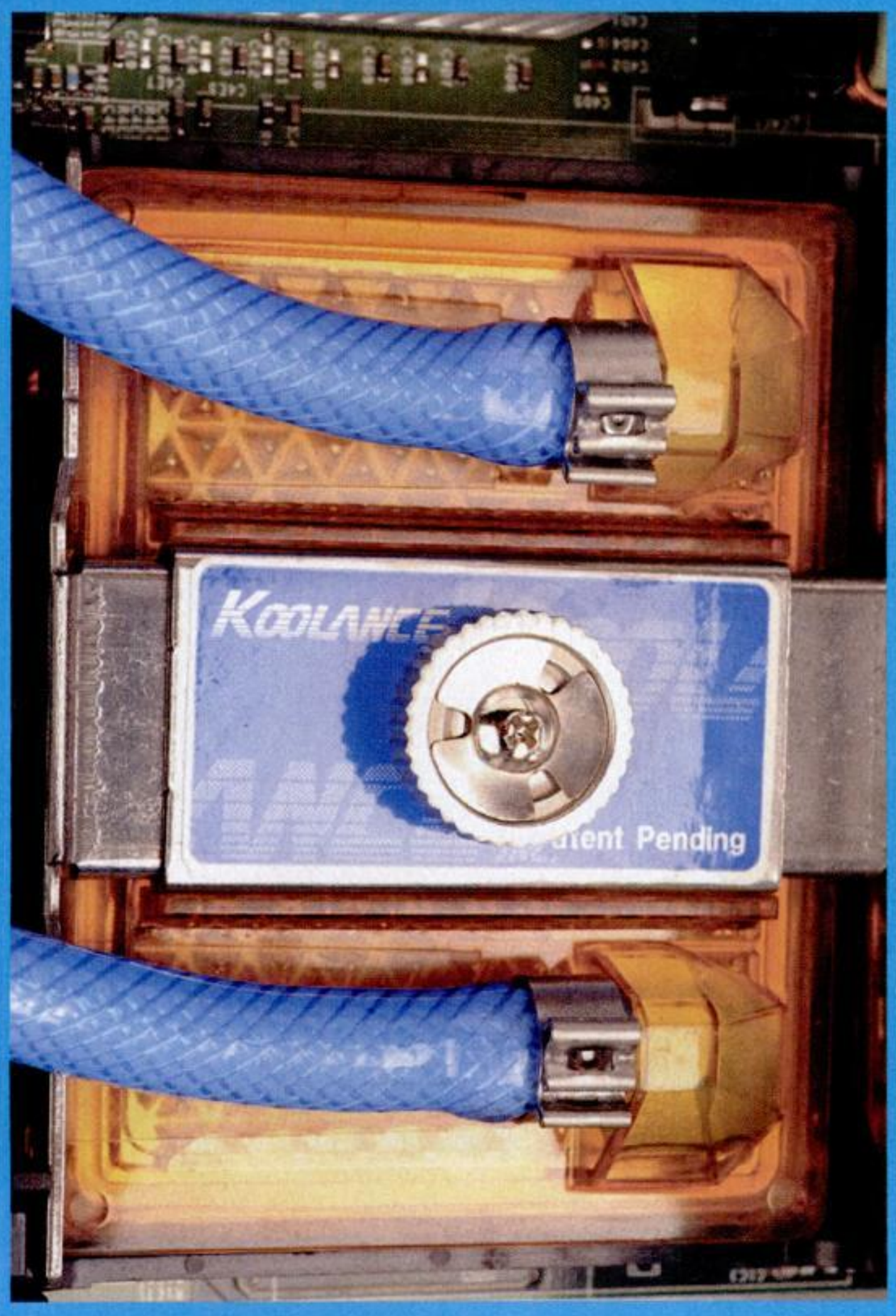
♦ **Swab the deck:** When working on a water-cooling kit, have a towel ready to soak up any spilled water. If you've dropped some water on your PC's components, dry it and wait at least a day before you plug the system back in.

♦ **Burp it:** Bleed your system of air by running it before installation. Turn on parts (such as the radiators) to allow bubbles to float up towards your fill hole. Carefully trickle in more water to flush out the air.

♦ **A dry run:** To make sure leaks are nonexistent, run your filled kit outside of the case for 24 hours.

♦ **Work out the kinks:** When its time to install, make sure none of your tubing gets kinked. Kinked tubing will not only put undue stress on your pump, but can greatly restrict water flow and your kit's overall cooling ability.

♦ **Check your pulse:** Use a program like *Motherboard Monitor* (**mbm.livewiredev.com**) to keep an eye on your CPU temperatures. Should your pump or radiator fan stop working, things will get hot very quickly.



Clamps are the greatest point of failure in a water-cooling kit. Keep an eye out for cracks in the hose mounting points.

Phase-Change Conundrums

Compared to water-cooling kits, sub-zero phase-changing systems are easier to install. But that doesn't make them any safer than their ambient-temperature amigos. The extreme cold generated by the phase-change evaporator freezes moisture in the air, forming ice crystals around the heads and surrounding area. The problem is that this ice melts when you shut down your PC, dripping water all over your motherboard, CPU, and CPU connecting pins. Yikes!

Surprisingly, a few drops of water probably won't cause a short in your system (the gushing stream from a compromised water-cooling tube is a different story entirely). Nonetheless, melted ice droplets are still disconcerting and can lead to rust in the long run. To make sure your overclocked processor doesn't oxidize, the mad scientists behind PC phase-changers have come up with two solutions to the condensation problem.

♦ **Isolation:** By enclosing the cooling head in a hermetic chamber, you limit the airflow that reaches the super-cold cooling head. With a limited amount of air, very little airborne moisture is available for the cooling head to freeze. Prometeia uses a goop string to seal off the chamber, while Vapochill uses several layers of foam to partially restrict airflow.

♦ **Spot heat generation:** While the CPU remains frothy and cold, little heating pads keep the surrounding materials and motherboard warm. It might seem counterproductive to heat a cooling system, but this scheme prevents condensation from forming. The Prometeia system has heating elements built into the cooling head, and the Vapochill uses dual heating pads around the CPU and in the back of the motherboard.

eXtreme COOLING

Water-Cooling Add Ons: Everything but the kitchen sink

Water-cooling your CPU is just the beginning. From temperature monitors to heat blocks for your hard drives, accessories are available to upgrade your "babbling brook" to "Panama Canal" status. Water-cooling kits and accessories sport true plug-and-play functionality, but you should still make sure that the interface diameters of your plumbing and the parts you order jibe.

1) Innovatek HDD-O-Matic: A dual block cooler for your hard drive. $54, www.highspeedpc.com

2) Innovatek Graph-O-Matic: A videocard heat block for your GeForce4. $39, www.highspeedpc.com

3) Eheim 1048 Pump: The big brother to the Eheim 1046 pump moves 158 gallons per hour, taking your kit into high-flow territory. $65, www.highspeedpc.com

4) Innovatek Tank-O-Matic: Innovatek's 280ml cylindrical reservoir includes an aluminum top for easy filling and bleeding, a mounting kit, and those bulletproof steel hose fittings we love. $70, www.highspeedpc.com

5) Tygon Tubing: This laboratory-grade tubing is extremely limber, yet kink resistant. Perfect for working your way around a tight case. Six feet for $13, www.highspeedpc.com

6) Innovatek Dual Fan 120mm Radiator: A hefty upgrade to any wimpy radiator, the Innovatek dual-fan radiator dissipates heat quickly without reducing flow rates significantly. $89, www.highspeedpc.com

7) Anti-Kink Springs: Keeps your hosing—and water—running true. $8, www.highspeedpc.com

8) Electronic Flow Meter: The flow meter triggers the fan speed counters on your motherboard to let you know your pump is still working. $40, www.highspeedpc.com

9) BayRes: A clear reservoir that fits in a standard drive bay. Hose fittings come in both 3/8-inch and 1/2-inch sizes, with a top hole for air bleeding and filling. $30, www.dtekcustoms.com

10) Inline Thermal Sensor: Set up with a standard thermal diode, this sensor can be hooked up to most temperature monitoring systems out there. $15, www.dtekcustoms.com

♦ **UV Sensitive Dye:** Use a few drops of this UV sensitive dye with a UV cathode tube for water that looks like a mutagen. $13, www.dtekcustoms.com

How We Tested

All systems were tested using the same Asus P458X board and Intel Pentium 4 2.8GHz. Baseline temperatures were recorded by *Motherboard Monitor* using the internal CPU diode after one hour of 100 percent CPU usage induced by *CPU Burn In*. Temperatures provided by the diode aren't necessarily accurate—but are consistently inaccurate among all the systems, giving us a good idea of how each system cooled relative to the others. Stock cooling temperatures were the result of using a stock Intel fan/heatsink combo. Water-cooled systems were set up and bled free of air before being installed. Phase-change kits were run for a 24-hour break-in period before being installed.

HARDWARE GOD'S OMEGA SYSTEM

All of the cooling, none of the hassles

If you're ready to own a supercooled PC, but aren't ready to build one, check out some system builders that are ready to take the footwork out of owning one of the coldest PCs on the planet. Hardwaregod's Omega system features a Prometeia phase-changer working the CPU, a water-cooled videocard, and a warranty. Imagine that!

www.hardwaregods.net

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Patriotic PC CASE MODDING CONTEST

We don't care if you lean to the left or lean to the right. How you manifest your patriotism is up to you. But we do want your submission for our **PATRIOTIC PC CASE MODDING CONTEST** to be as spectacular as possible.

We're not just looking for elaborate paint jobs and inventive ornamentation—we're looking for highly personalized works of American folk art! Your submission for the Patriotic PC Case Modding Contest need not include any American flag motifs, but it must allude to some type of ideal or institution that makes America the greatest nation on the planet in which to express one's creativity.

Seriously, folks, do you think Switzerland could have come up with lowrider bikes?

Win $500 in Prizes!

What you Can Win:

Each of our 3 winners will receive a $500 BUNDLE of upgrade parts and peripherals, including a Creative Labs Zen Jukebox MP3 player, and 120GB Western Digital hard drive featuring an 8MB cache.

RULES

Your submission packet must include the following: Your name, street address, and daytime phone number; three high-resolution JPEGs of your patriotic creation; and a 300-word description of what your PC represents, how it was constructed, and what PC parts and materials it uses. All contest entries must be full-fledged, working PCs.

DEADLINE: E-mail your submission packet to input@maximumpc.com by no later than **APRIL 15, 2003** (that's Tax Day folks—oh, the irony!).

Winners will be contacted by May 1, and the three winning entries will be featured in our July issue.

Suggested Themes

- ★ *"Stars and Stripes Forever"*
- ★ *"Barrel Bombs and Bottle Rockets"*
- ★ *"The Battle of the Bulge"*
- ★ *"Burning Man: A New American Tradition"*
- ★ *"The Right to Bear Arms"*
- ★ *"Baseball, Hot Dogs, Apple Pie, and Chevrolet"*
- ★ *"July 20, 1969"*
- ★ *"I'm a Yankee Doodle Deejay"*
- ★ *"Canada: America's Best Friend"*
- ★ *"England: Uh, Aren't We America's Best Friend?"*

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Ask the Doctor

Symptom → Diagnosis → Cure

Have a burning PC problem? How about a burning PC sensation? We're more than happy to help you with your PC problems, but you might want to get that sensation thing checked out by a qualified sensation checker-outer. If you have PC questions, send them to **doctor@maximumpc.com**. Just remember: We can't answer every e-mail. Oh, *no*—not by a long shot.

Age-Old Win98 Tricks

I'm running Windows 98 SE, and just did a clean install. I once read in your column that to prevent the computer from always asking for the Win98 CD, you should copy the Win98 folder from the CD to the C: directory, and change the Registry to point there. Could you remind me where that Registry entry is?

—JOE ROSENBERG

This is an oldie but goodie, so the Doctor will run it again. To change the location where Windows ME, 98, or 95 looks for the install .cab files, open Regedit and browse to HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\Setup and change the SourcePath key to point to the directory to which you copied your .cab files.

For the record, all you need are the contents of the Win98 directory from your install CD, and we recommend you toss them in the C:\Win98\ directory.

CPU Slowdown?

I recently noticed that my AMD 1.1GHz processor has changed speed. It had operated at 1.1GHz for more than a year and a half, but now it's operating at 850MHz. The mobo is an Asus A7M266. I haven't fooled with anything in the case, and no one else has used my system. How did this happen?

—TONY PIERRE

Over time, the material that's used to unlock the bridges can wear away, and the CPU can default to its stock 850MHz speed.

Your system's CMOS was likely reset. The Doctor has seen systems occasionally "forget" their configurations, and it is usually the fault of a bad connection on the CMOS battery, static buildup, or a dying CMOS battery. (The CMOS battery is that coin-cell on your motherboard). What you need to do is go into your BIOS and verify that the system bus is running at 133MHz. When the CMOS lost its contents, it probably defaulted to a 100MHz bus. The math backs this up: 8.5x100=850MHz; 8.5x133=1100MHz.

The other possibility is that your system builder used a remarked Athlon. That is, he or she took an 850MHz Athlon, shorted the L1 bridges, and reset it to 1.1GHz. Over time, the material that's used to unlock the bridges can wear away, and the CPU can default to its stock 850MHz speed. If the Doctor were a betting man, he'd wager that your problem is more likely the first scenario than the second.

Hosed by GoBack

My computer won't boot after I installed Roxio *GoBack 3* on my computer. It came with the *Norton System Works 2002* package. I'm not the only one with that problem, either. Others are having problems with *GoBack* when running either Windows XP or 2000. Symantec is giving some lame excuse for these problems and advising users to disable the app. How in the hell can I disable it if I can't boot my computer?! Neither "Last known good configuration" nor Safe Mode work.

—LIST SGT MICHAEL K

The Doctor isn't sure whether you're running Windows 2000 or XP, but it sounds like you're due for a format and reinstall. We don't know of another solution. Just make sure that after you wipe the drive and reformat you don't reinstall *GoBack*.

If you need to back up info from an NTFS partition, the standard technique is less than straightforward. First, reinstall your OS (without formatting) in another directory on the drive (this will preserve the contents of your Windows directory). Next, boot into the new directory on the drive. You should be able to back up any files you need now.

After you've saved your data, boot off your Windows CD and make sure you do a full wipe of the drive during the install process. When you're asked to choose which partition to install Windows in, select your old C: partition and press D to delete what was previously there. Follow the prompts to create a new Windows partition, then reinstall your apps.

This isn't the first time a Roxio app completely hosed the install on an NT-based OS. Versions of *Easy CD Creator* were notorious for arbitrarily, and without warning, destroying Windows 2000 installs. For that reason, we always recommend checking Roxio's web site for known issues and patches before installing any Roxio software.

Scroll Wheel a No-Go

I decided to go out and purchase the Logitech MX-700 mouse that got a rave review in the November issue. However, I ran into a little problem that I can't get around. If I install the Logitech software, I can't use the mouse's scroll wheel for games, but if I uninstall the software, the wheel works fine. The FAQ at the Logitech site addresses the problem and how to fix it, but it didn't help with the MX-700. Is there a way to use the *Logitech* software *and* have the scroll wheel work in games?

If you don't select these two options, your scroll wheel won't work in games.

—SEAN COWGER

It's odd that you mention this problem, Sean, as the Doctor has experienced it on some machines but not others with almost exactly the same config. Luckily, when we contacted Logitech, we were not only offered a fix, but assured that *Mouseware* version 9.75, which should be available by the time you read this, is free of the flaw.

If it's not, our Logitech contacts assure us that you can get the scroll wheel working in games by opening the mouse control panel and going to the Buttons tab. Check the box next to "Use MS Office Compatible Scroll

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Only," then check the box next to "Scroll in active window only." That should get the scroll wheel working in your game.

If you didn't use *Mouseware* to program any of your mouse's buttons, you can also just uninstall *Mouseware* and reinstall the 9.75 version when it's available.

The Virus That Never Was

I loved your August 2002 feature story about giving Windows XP a Clean Start and wanted to do it to my PC. I purchased PowerQuest's *Drive Image 2002* and then did a clean install of Win XP. I followed the tutorial step by step and it worked great, I got all my main applications installed and then installed *Drive Image 2002*.

It's a myth that turning a PC on and off on a regular basis puts undue stress on your system.

When I run *Drive Image* and select the "Initial backup Wizard" and click "yes" to reboot the computer, I get this message during the boot: "Trend ChipAway Virus has detected a boot virus on your hard drive." It tells me to insert a clean floppy disk and reboot. I wasn't sure what to do, so I just rebooted. I checked my system with *Norton Antivirus 2002* and no virus was found. I only have this problem when I reboot the PC to use *Drive Image 2002* to make a backup image of my hard drive.

I'm confused. On the one hand, I trust *Norton*, but the virus warning does worry me. I think it might be that *Drive Image 2002* is giving me a false alarm.

—RON

In all likelihood, this "virus" is just a case of mistaken identity.

Your motherboard has a feature known as boot virus detection. To understand why your BIOS would have this kind of antivirus protection, you need to know something about boot viruses. Boot viruses were a serious problem back when transferring a file to a co-worker's PC meant putting it on a floppy disk and chucking the floppy across the room. The viruses spread when users forgot to eject a floppy before rebooting their PCs. An infected floppy would automatically boot into a program which would then infect the Master Boot Record on the hard drive in your PC. Anytime another floppy was inserted into the PC, its MBR was infected. Needless to say, these viruses spread quickly through offices.

Your BIOS has boot virus protection to protect your PC from infection before the OS (and your normal AV software) is loaded. Now, because *Drive Image* rewrites your MBR to boot into the program instead of your normal OS, your mobo thinks it's a virus.

The solution is to load your BIOS the next time your system boots, and temporarily disable boot virus protection while you run *Drive Image* and back up your drive.

Power On, Power Off?

I just recently climbed Mount Everest, and at the summit I met an old wise man who asked me the penultimate question troubling our world: "Is it better to leave a gaming PC on 24/7, or turn it on only when you want to play?" I told the old dude that only the Doctor would know.

—RICH GIRE

It's a myth that turning a PC on and off on a regular basis puts undue stress on your system. In fact, it could even be said that a PC running 24/7 suffers more wear and tear to the hard drive and fans. Leaving your PC running 24/7 probably won't harm the computer, especially if you set Power Management to turn off the hard drive after 20 or 30 minutes. It does get kind of expensive, though—leaving a powerful gaming PC running 24/7 is guaranteed to jack up your electric bill.

Windows Volume Licensing for Home?

Are Certificates of Authenticity (CoA) licenses for Windows XP real? Is Microsoft really allowing people to run the OS on multiple PCs without buying the full versions for each?

How do I know if I have a legit CoA? Can I use the version of Windows that came with my Gateway PC to upgrade my other PCs? I don't want to put money in the pocket of a pirate and end up running illegally.

—SCOTT CONNER

These CoA, or "sticker only," licenses are entirely legitimate if bought from a valid reseller. If you want to guarantee that your additional licenses are authentic, the Doctor recommends you buy them from http://shop .microsoft.com. A single Windows XP Home "sticker only" license for a PC without Windows costs $189. The Upgrade license costs $89.

The upgrade should work on any PC that has Windows installed, but we'd recommend against trying to use one of the full version installs with the "Restore CDs" that most major PC OEMs ship these days.

While it's nice to have volume licensing, buying the license from Microsoft may not be a very good deal. The week we went to press, a boxed retail version of the Windows XP Home upgrade was available for the same price as the license from Microsoft. If you want to buy a CoA license for cheap, your best bet is to head to Pricewatch.com, where sticker licenses start at $50.

I Can't Find XP Drivers!

I just bought a new ATI Radeon 9000 Pro 128MB videocard. I think it's incompatible with WinXP. I've looked for drivers and updates all over and can't find anything. This is a brand-new videocard! How can it not be compatible with the latest OS? I like XP, and don't want to downgrade. Any recommendations?

—DEREK TIBBITTS

The Doctor's first recommendation is that you try the CD that came with the videocard. The 9000 Pro that we received had perfectly serviceable XP drivers on it. ATI has also been providing regular driver updates at www.ati.com /support/driver.html for all OSes, including Windows XP.

If you're still not able to install the 9000 Pro driver, you may need to remove all traces of your old video driver from your system. Most drivers include an entry in the Add/Remove Programs Control Panel, but if they don't, you'll have to consult your old 3D accelerator's manufacturer for a procedure.

Missing Task Manager

I somehow lost my Task Manager. I have Windows XP, and when I press Ctrl-Alt-Del I get a window that is titled CPU Usage/CPU Usage History, but no Task Manager. When I click Task Manager after right-clicking the taskbar, I get the same result—no Task Manager. This all started after a BSOD and an automatic reboot.

—BRUCE FEINBERG

The Doctor's not quite sure how your problem came about, but he knows how to fix it. All you need to do is double-click the background of that mysterious window and the rest of the Task Manager will pop up. We're certain that this is somehow a "feature," but the Doctor doesn't see much use for it.

ATTENTION BAY AREA READERS!

Have a PC problem that you can't solve? Uncertain about the best way to upgrade your aging computer? We're looking for a few readers in the San Francisco Bay Area who are willing to bring their broken computers into our office for a day of troubleshooting, rebuilding, and camaraderie that will be chronicled in the magazine. (We cannot pick up your computer or conduct offsite troubleshooting.) If you're interested, send an e-mail describing your problem and a detailed list of your current PC specs to clinic@maximumpc.com.

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About Uninstalling Video Drivers

A letter from Alienware concerning your "Elite System Showdown" stated that the ATI driver was uninstalled, the machine was rebooted, and then a new driver was installed [In/Out, November 2002]. How does this work? When the video driver is uninstalled, will there be anything on the screen once the computer is rebooted? Does the new driver install automatically, with no input required by the computer operator? If there is nothing on the monitor, how does the operator perform the new installation?

I hope this question isn't too elementary for you, but I would appreciate learning how a new driver is installed, since I will be upgrading my video soon, and will have to go through the same procedure myself.

—BILL BLOCK

When you uninstall a video driver in Windows, no matter the version, the OS uses the default VGA driver, which should work with every videocard out there. The result is that your card and the OS will bump the resolution down to a mode that all cards and monitors can support. Then you'll be able to reboot the PC and reinstall the new driver.

Messenger Mumbo Jumbo

I have a PC with XP Home edition on it and a cable modem connection to the Internet. Every 15 minutes or so, I get a message from Messenger that's an advertisement of some kind being broadcast to my IP address. Is their any way of stopping these messages from popping up?

—ROBIN DOCWRA

Spamming people with the Messenger app built into Windows is the newest, lamest attempt to get people to "increase their penis size" or "work from home." To stop the spam you have two options: Either install a firewall, such as *Zone Alarm* (www.zonelabs.com), or turn off the Messenger service. Note that the Messenger service is different from the *Windows Messenger* instant messaging client. The service is used by system administrators and some system utilities, but it's safe to disable it on most home machines.

To turn it off, open the Services panels by going to Start >Control Panel > Administrative Tools > Services. Scroll down until you find the Messenger service. Right-click it, and select Properties. Then change the Startup Type to Manual. Press the Stop button to shut down the service, and press OK to save your settings.

That's all you have to do to stop the Messenger spam.

More on 4-in-1 Drivers

I've heard that I need to upgrade my 4-in-1 drivers. Now that I've found them, how do they work (see advertisement)?

—ROB PENNER

Are your 4-in-1 drivers getting musty? Get the latest updates, for only $2.49!

The Doctor did a full-blown spit-take when he opened your attachment, Rob! Thanks for the laugh…

But it's important to remember that 4-in-1 drivers aren't a laughing matter. Old 4-in-1 motherboard drivers can cause random crashes, spontaneous reboots, 3D game glitches, and horrible rashes. If you need the latest 4-in-1 drivers for your mobo's chipset, Here's where you should look:

- **Get the latest Intel chipset drivers at www.support.intel.com**
- **Via's latest drivers can be found at www.viaarena.com**
- **If you're looking for AMD drivers, head to www.amd.com**
- **Seeking SiS drivers? Check out www.sis.com**

How Does HDTV Work?

I recently purchased a 47-inch HDTV-ready projection TV and decided I would try to hook it up to my PC (and hopefully get rid of my original monitor). My videocard is a GeForce4 Ti 4200 with TV out. I connected it to my television and used *nView* to make a clone of my monitor. It worked fine, but I can't get the resolution for the TV higher than 800x600, which gives me a very blurred picture. Is there any kind of adapter, software or PC card I can use to make this a better viewing experience? I'm desperate here, so anything you can think of would be appreciated.

—GEORGE STROM

Your problem is two-fold. You're trying to connect your PC to your HDTV using either an S-video or composite connection. These connectors just don't have the bandwidth to send a high-quality video signal. The other problem is that your Ti 4200 doesn't support HDTV resolutions. (To date, no nVidia product supports HDTV resolutions.) The result is that your PC is treating your expensive HDTV exactly like it would a 13-inch Colormaster RCA, circa 1985.

This little wonder, the ATI VGA-to-HDTV adapter, will let Radeon 8500, 9000, 9500, and 9700 owners use their 3D accelerators with a HDTV at high resolution.

The good news is that any ATI Radeon 8500, 9500, or 9700 will work with the HDTV adapter that ATI sells ($30 at www.ati.com), and the All-in-Wonder Radeon 9700 (reviewed on page 72) ships with HDTV output support.

What Does Format Actually Format?

I have a Dell 4100 1GHZ with 512 SDRAM and a newly bought 100GB IBM hard drive. Once I bought this hard drive I started to download stuff to fill that newly added space, and now I need to reformat because I have a problem with my Windows installation that causes it to lock up. I want to reformat my computer, but keep the 60GB of stuff and on my other partition. I've tried using *Partition Magic*, but it keeps saying I have antivirus software running before Windows even starts up! If I reformat using *fdisk* or something, then I would lose my entire hard drive.

—SAM CHEN

To get a clean install of Windows, you don't need to wipe the entire partition structure from the drive, you can just delete the system partition using the partition manager in the Windows installer, and leave the partition with your data intact.

To do this, boot off the Windows XP install CD. When you get to the part that asks you which partition you want to install Windows on, select your current C: partition and press D to delete it. Follow the prompts until it's gone. Then select the newly empty space on your drive and press C to create a new partition. After the format is complete, you should have a minty fresh partition to install Windows on, and still have all the data from your 60GB partition with which to enjoy it. ■

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How To...

A step-by-step guide to tweaking your PC Experience

BUILD A PC Entertainment CENTER

MAXIMUMPC
TIME TO COMPLETION
04:30
HOURS MINUTES

BY WILL SMITH

Throw away your game console, DVD player, and TiVo. Here's how to make the perfect PC for living room deployment

HP and Alienware are doing it, so why aren't you? Media Center PCs—which play DVDs, record liveTV, and manage entire digital music collections—are the latest craze.

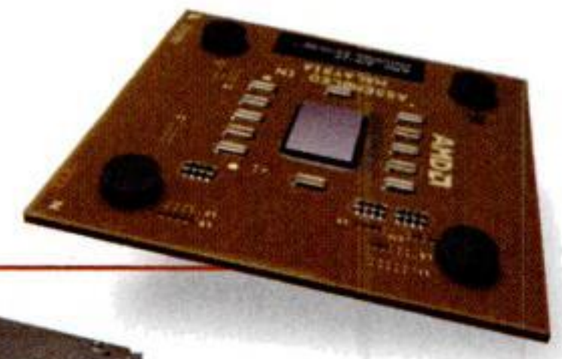
Unfortunately, the Windows XP Media Center Edition isn't available for retail purchase. You can get it only if you buy a pre-fab Media Center system from a system manufacturer. The Media Center extension to the basic WinXP operating system is expressly designed to work with a hardware remote control unit and lets you use your PC as a turnkey digital media command center. We can understand why the Media Center software isn't going retail: Our OEM friends tell us it works with only a very short list of approved hardware configurations.

The good news is that you don't need Media Center software to enjoy Media Center features. The software just streamlines the entertainment experience for couch potato convenience. This month, we'll show you how to build your own PC entertainment center, using readily available, off-the-shelf parts.

Shopping List

We used the following parts, but substitutions are discussed later in the article.

- **Shuttle nForce2 XPC (a bare-bones mini-case with a preinstalled nForce2 motherboard)**
- **Athlon XP 1800+ processor: $80**
- **128MB PC2400 DDR SDRAM: $100**
- **185GB IBM Deskstar hard drive: $325**
- **Sony DRU500A DVD recorder: $350**
- **ATI All-in-Wonder 9700 Pro videocard: $450**
- **A mini-headphone jack extension cable: $10**
- **A TV, HDTV, or PC monitor**
- **5.1 speaker set with a digital decoder**
- ***MusicMatch Jukebox Plus*: $30**



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Components in Detail

Before you configure your entertainment center, you need to decide exactly what you want to do with it. We wanted to play DVDs; play, pause, and record liveTV; play digital music; enjoy an occasional game; and archive everything to a recordable DVD. We tailored our project PC to these specifications, but in the following paragraphs, we tell you where you can scrimp if you want to ditch some of our features.

CPU, CHIPSET, AND MEMORY

The nForce2 core-logic chipset can do Dolby Digital 5.1 encoding in real-time, so we were intent on buying a bare-bones Shuttle case that features this chipset. This chipset is compatible only with Athlon CPUs, so if you don't want to be locked into the AMD platform, you might consider the Shuttle SB51G, which runs Pentium 4s.

As long as you have sufficient CPU speed and memory capacity (1.5GHz and 256MB, respectively), you should be fine, even if you're using ATI's software encoder forTV recording duties. If you're *not* planning to use your PC as aTiVo replacement, you can skimp on CPU power. DVD and MP3 playback are much less CPU-intensive than on-the-fly video encoding.

3D ACCELERATION AND TV FUNCTIONALITY

ForTV viewing and recording and 3D acceleration in a single AGP slot, there's really no better alternative than the ATI All-in-Wonder 9700 Pro (see our review on page 72). It combines the awesome 3D speed of a Radeon 9700 Pro with the multimedia prowess of previous All-in-Wonder products, and even includes a handy wireless remote control.

If you're looking for theTV viewing goodness, but don't need top-shelf 3D power, consider the ATI All-in-WonderVE. It has all the sameTV functionality as the 9700 Pro without the expensive 3D accelerator.

MASS STORAGE

When it comes to your storage sub-systems—i.e., your hard drive and optical drive—bigger is always better. However, if you're not planning on using your entertainment PC forTV recording and "timeshifting" duties, your hard drive can be significantly smaller. While 40 hours of recordedTV can consume 128GB of hard drive space in a flash, even a massive MP3 collection with more than 3,000 tunes will absorb just 15GB of space.

If burning DVDs isn't your bag but you still want to watch DVDs and burn music CDs, you should get a CD-RW/DVD-ROM combo drive. We recommend the Samsung SM-332. It will burn CDs at 32x, and rips audio quickly, too. It's also significantly cheaper than the Sony DVD-RW/+RW drive.

INPUT OPTIONS

Even though the All-in-Wonder ships with a good remote, you'll still want a reliable wireless keyboard and mouse, for games if nothing else. Logitech's Cordless Keyboard is quite nice and reasonably priced at $40. We're also fans of the Gyration Ultra mouse, which works as either a normal optical mouse or by waving it around in mid-air. It's perfect for couch gaming! Gyration also sells a compact wireless keyboard, but we haven't yet tested it.

Putting It All Together

You'll need to install the CPU, memory, drives, and AGP card before you can start using your new PC. If you've never built a PC before, see our "Build It" feature in the magazine reprints section at MaximumPC.com. If you have built a PC before, but are nervous about digging around the Shuttle box's guts, here's a short cheat sheet.

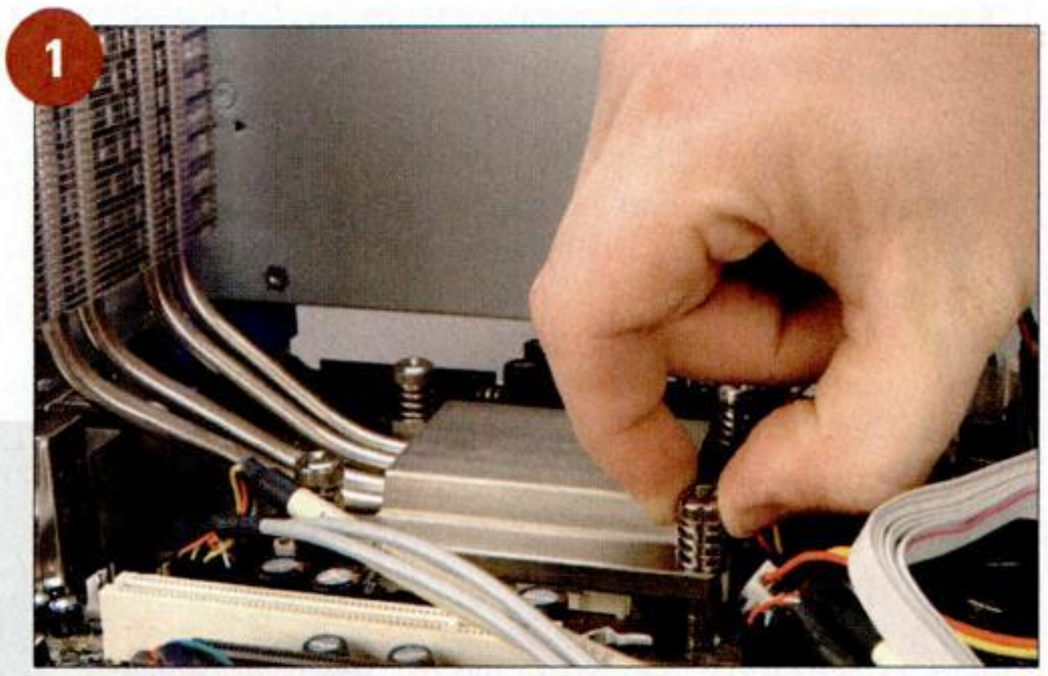
STEP ONE CPU AND MEMORY

First, you'll need to open your Shuttle case and remove the drive cage (the big U-shaped metal thing near the optical bays at the front of the case). Next, you'll need to remove the CPU cooling assembly. First, unscrew the thumbscrews holding the fan mount on the outside of the back of the case. Second, lift the fan assembly off the radiator, and unscrew the screws that hold the heat pipe to the CPU socket (figure 1).

Now you can lift the CPU locking lever and gently drop the CPU into its socket, making sure not to force it in. Push the lever back down until it clicks into place (figure 2). After the CPU is seated, apply a small amount of thermal grease to the core, then replace the CPU cooling mechanism. Make sure not to over-tighten the heatsink when you lock it down. You should tighten the screws by hand, and then give them a quarter twist with your screwdriver. Over-tightening can kill your Athlon.

Next, install the memory. All you need to do is slide it into the slot, then push down until it clicks into place. It's an absolute pain in the ass to install the RAM after you've reinstalled the drive cage, so make sure you do things in order!

1



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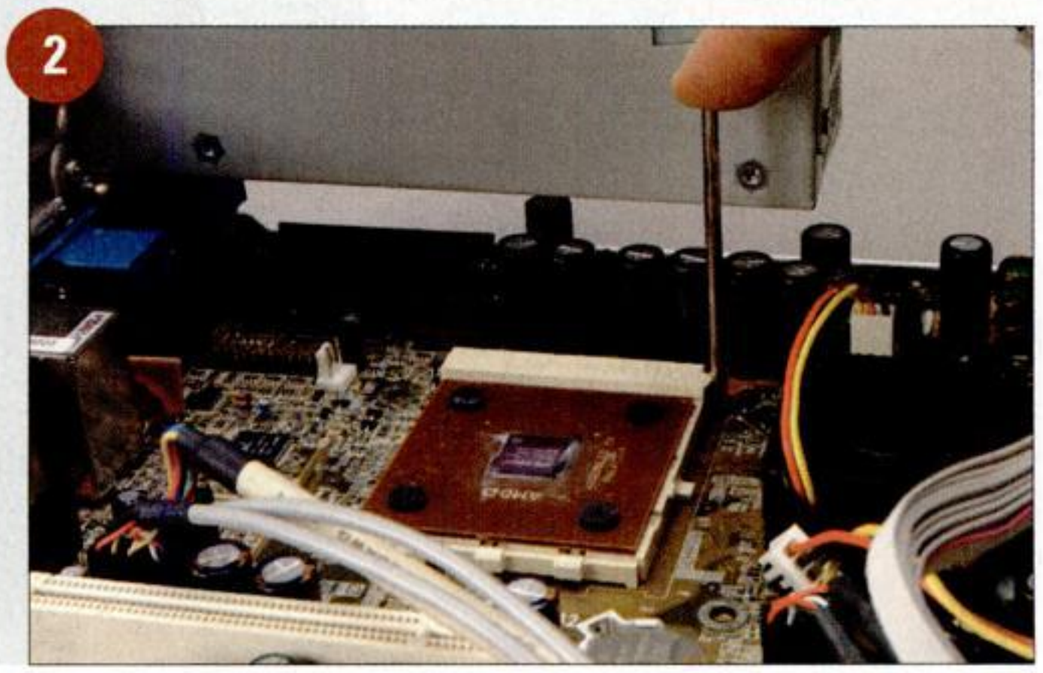

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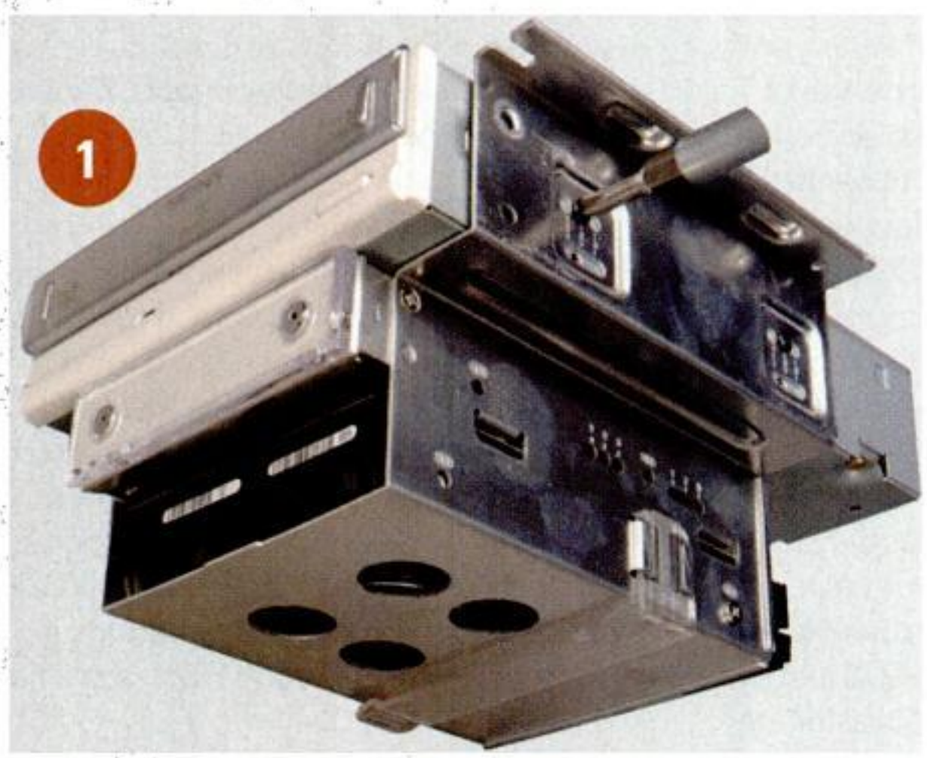
STEP TWO INSTALLING YOUR DRIVES

Now that your CPU and memory are installed, it's time to plug in your drives. Take a look at your Shuttle's drive cage. We recommend putting the hard drive in the bottom slot and the optical drive in the top slot, and forgoing a floppy drive—1.44MB just isn't enough space to fool with these days. There are specific holes lined up in the bottom slot of the drive rack for the hard drive, but you'll need to make sure the optical drive's front panel lines up properly with the front of your Shuttle case. You can do this by lining up the bezel of the drive with the 3.5-inch slot cover that's mounted in the drive caddy (figure 1).

Once the drives are mounted in the drive cage, you'll need to slide the cage into the case. Before you do, make sure the jumpers for the drives are set properly. The hard drive should be set to be master and the optical drive should be set to slave. We recommend plugging the IDE and power cables into your hard drive before you set the cage in your case. They're difficult to access once the drive cage is screwed down.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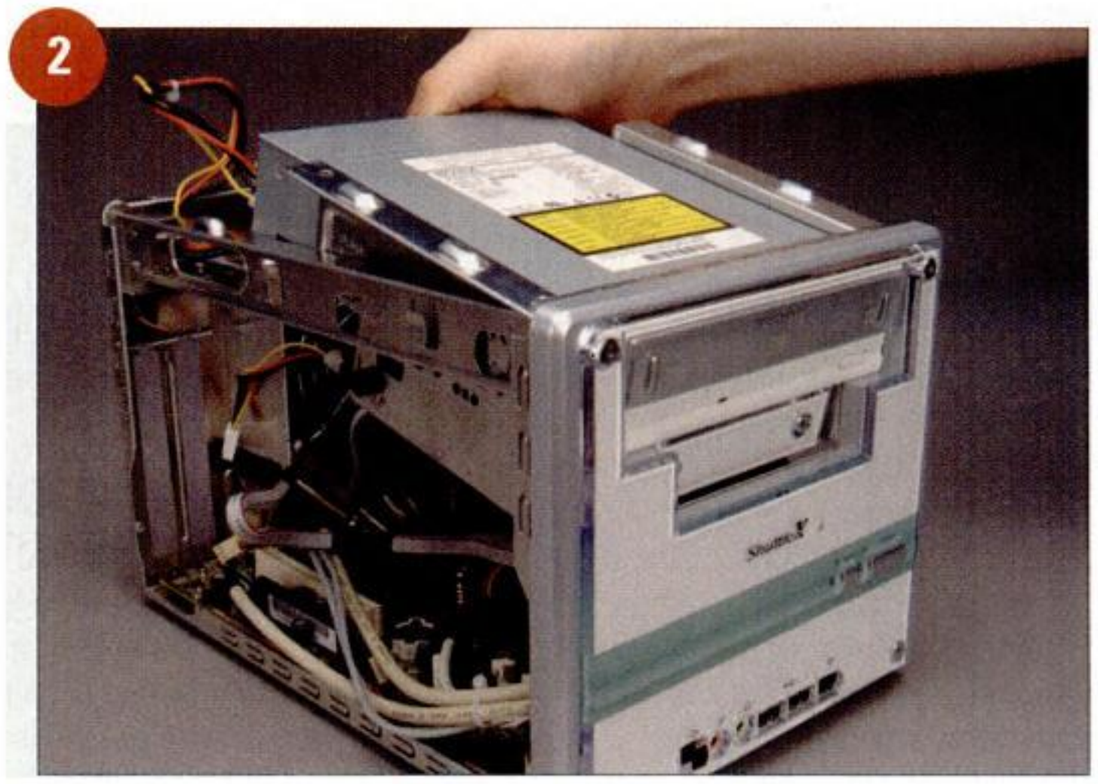
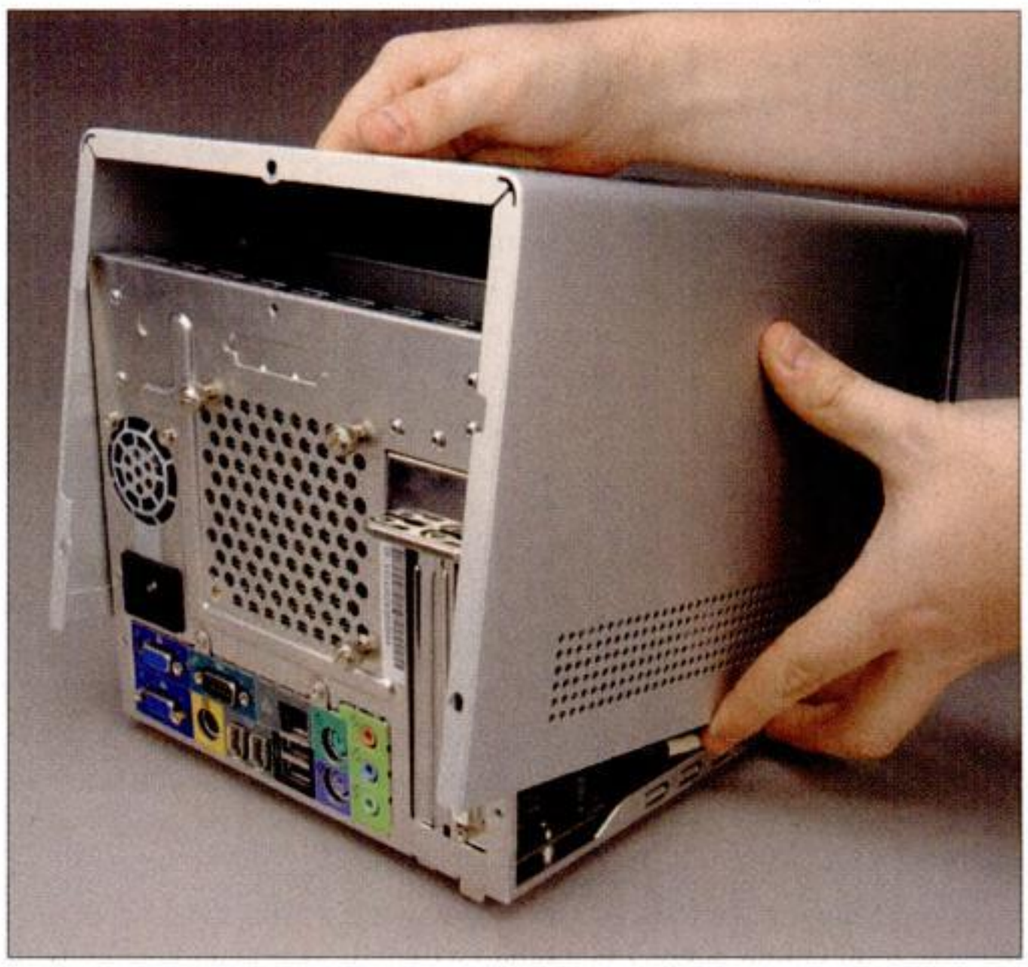

2

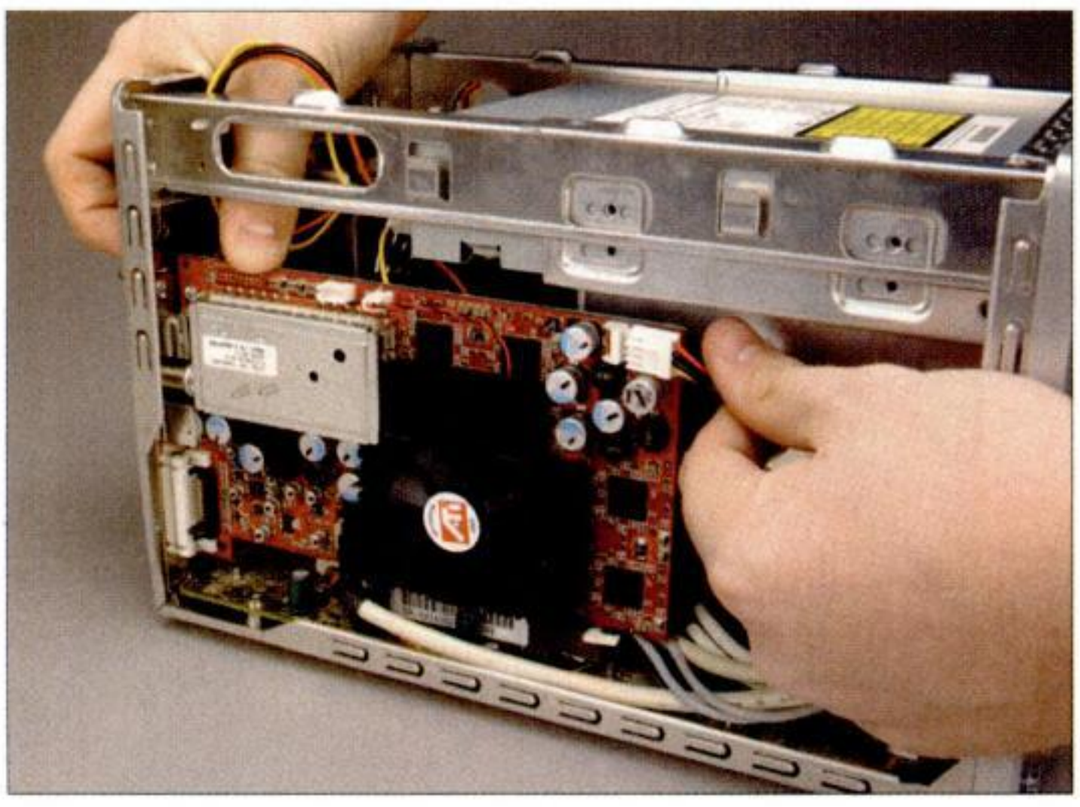
Slide the drive cage into the case bezel first, and then lower the back end until it's flush with the top of the case (figure 2). Be very careful not to force it. You may need to adjust the IDE and power cables to get everything in. If you're using an All-in-Wonder 9700 Pro, you'll also need to keep a floppy power connector available on the left side of the case to give the board the additional juice it needs. Once the cage is in the case, you can slide it all the way forward and lock it in place using the screws on the top.

STEP THREE INSTALLING YOUR VIDEOCARD

All that's left on the hardware front is the All-in-Wonder 9700 Pro. Turn the case around until you have easy access to the left side, and remove the slot cover from the AGP slot's faceplate. Next, slide the 9700 into the slot and screw it into the mounting bracket. Last, you'll want to plug a floppy power connector into the All-in-Wonder's power jack (see image).

Make sure you pick the proper output dongle for the videocard. If you're going to use a monitor or normal TV as your display, use the black dongle. HDTV users will need the red dongle. Connect the audio output on the dongle to the microphone input on the front of the PC using your headphone extension cable.





STEP FOUR CLOSING THE CASE

Everything's installed, so you can plug the keyboard, monitor, and power into the PC and power it up to make sure it passes the Power On SelfTest (POST). If the PC POSTs properly and all your drives are detected by the BIOS, you can pull the power and put the cover back on the Shuttle box. Make sure you don't catch any wires when you're closing the cover, and that the sides get into their guide grooves.

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Getting the Software Working

Next up, we'll install the software you'll need to run your entertainment PC. You'll need a copy of Windows XP Home or Professional and some of the bundled software that comes with the videocard (the ATI drivers, *Pinnacle Studio 8,* and *Mediator 7).*

INSTALLING WINDOWS

Installing Windows XP is generally pretty easy. If you have a hard drive that's larger than 133GB, you'll need to pay close attention during the hard drive partitioning sections of the install.

If your hard drive is larger than 133GB, anything beyond the 133GB mark won't show up in the Windows XP partitioning tool. To fix this, we recommend that you create a small 40GB partition using the XP installer, install the OS on that partition, install the chipset drivers for your motherboard, and then create a large partition using the rest of the drive.

Why create just a 40GB install partition? Because we plan on using that drive only for the OS, the important applications, and digital music. Even a massive music collection probably won't be more than 20 or 30GB, leaving plenty of room for Windows XP and your applications on the C: partition. Don't partition or format the rest of the drive until Windows and the chipset drivers are installed.

Once your Windows install is up and running, go into the Computer Management tool by going to Start, then Run, and typing `compmgmt.msc`. From there, go to the Storage section and look under Disk Management. Right-click the unformatted section of the drive, select Create partition, and make a primary partition. Then you'll need to format your new partition by right-clicking it and choosing Format.

After you've installed XP, you'll want to install Service Pack 1 (available at **www.windowsupdate.com**) and reboot. You'll also need to install your chipset drivers and ATI's All-in-Wonder 9700 Pro drivers, rebooting as prompted.

RECOMMENDED SOFTWARE

Once your drivers are installed, we recommend installing the software bundled with the All-in-Wonder. The ATI Multimedia Center and remote control software will let you use the PC without a keyboard and mouse, and seamlessly switch between watching TV, listening to music, and viewing DVDs.

The first time you launch the ATI TV app, you'll be prompted to start a setup wizard. When you're in the wizard, make sure you set ATI's TV timeshifting app to use the large hard drive partition you just created instead of your smaller C: partition. By isolating the video on the large partition, you'll maximize the amount of video you can record as well as minimize the drive fragmentation that inevitably occurs during TV timeshifting.

Pinnacle Studio and *Mediator*—which are bundled with the All-in-Wonder—will let you encode captured TV shows in the proper MPEG-2 format so they will work on set-top DVD players. You'll then be able to burn your videos and captured TV shows to disk using *MyDVD 4.0,* which is bundled with the Sony drive we recommend.

Finally, we like *MusicMatch Jukebox* to play all our digital music, organize playlists, manage ID3 tags, and burn songs to CD.

Output Options

Now that your media center is set up, you need to configure it for your particular output options. Everyone knows how to plug a normal PC monitor into a PC, but using a normal TV or an HDTV as your display can be tricky. Besides discussing display connectors in this section, we'll also show you how to hook up your home stereo speakers to your PC (in the event your "multimedia speakers" are $10 throwaway jobbies).

Before you disconnect the monitor you used during setup, make sure you set the resolution in the Display Control Panel to the minimum. That will help ensure that you'll be able to see and configure your new display when you connect it.

USING AN HDTV AS YOUR MONITOR

The All-in-Wonder 9700 Pro includes an HDTV output that will work with any HDTV at any of the HDTV resolutions. The dongle is red, and has five outputs. You'll use the red, green, and blue RCA outputs to connect to your HDTV. The orange is a coaxial digital output, which you won't use. The blue mini-headphone plug needs to be connected to the microphone input on the front of the PC (if you don't connect it, you won't get any audio when you're watching TV).

USING A NORMAL TV

The resolution of a normal TV is pretty shameful in this age of 1600x1200 flat panels. However, the low-resolution doesn't preclude you from using your entertainment PC to watch TV, view DVDs, and listen to tunes. Just connect either the RCA composite or S-video outputs of the videocard to your TV (your videocard should have the necessary cables).

The max resolution most TVs will display is 800x600 at 60Hz, so you'll need to make sure that your PC's display settings are adjusted to these specs before you connect your TV to your PC. Also, the OS is much easier to use if you set it to use large fonts and icons. Go to the Appearance tab in Windows' Display Properties control panel, and change the font size to Extra Large. Then click the Advanced button, select the Icon item, and change the size from 32 to 45. Press OK and then press Apply.

USING A DIGITAL 5.1 SPEAKER RIG

If your home theater receiver has a free Toslink optical SPDIF input, use it—it's the best interface for PC connections, and it's simple as pie to use. All you need to do is plug one end of the optical cable into your receiver and the other end into your PC. Then go into the nForce control panel (by double-clicking the system tray icon), and make sure that the Digital output box is checked. Select the proper digital input on your receiver, and you should be good to go.

USING AN ANALOG SPEAKER RIG

Let's get this straight: Analog speaker rigs aren't optimal for the kind of home theater system we're putting together. With analog connectors, you often lose the 5.1 positional audio that a digital connection provides, and get pure stereo sound instead. Of course, if you're just listening to music, that's fine.

To connect your PC to a stereo, you'll need a mini-headphone-to-stereo-RCA cable. You can get these at Radio Shack for less than $10. Plug the headphone end into your PC's main sound output (the green jack), and the other end into a spare set of inputs on your receiver.

If your receiver has 5.1 analog inputs, you might be able to use the analog 5.1 outputs on the back of the Shuttle box and three mini-headphone-to-RCA cables. Unfortunately, we weren't able to test this config with the hardware we had in the Lab.

Believe it or not, you now have a fully functioning PC that's perfectly outfitted for living room entertainment. Have fun! ■

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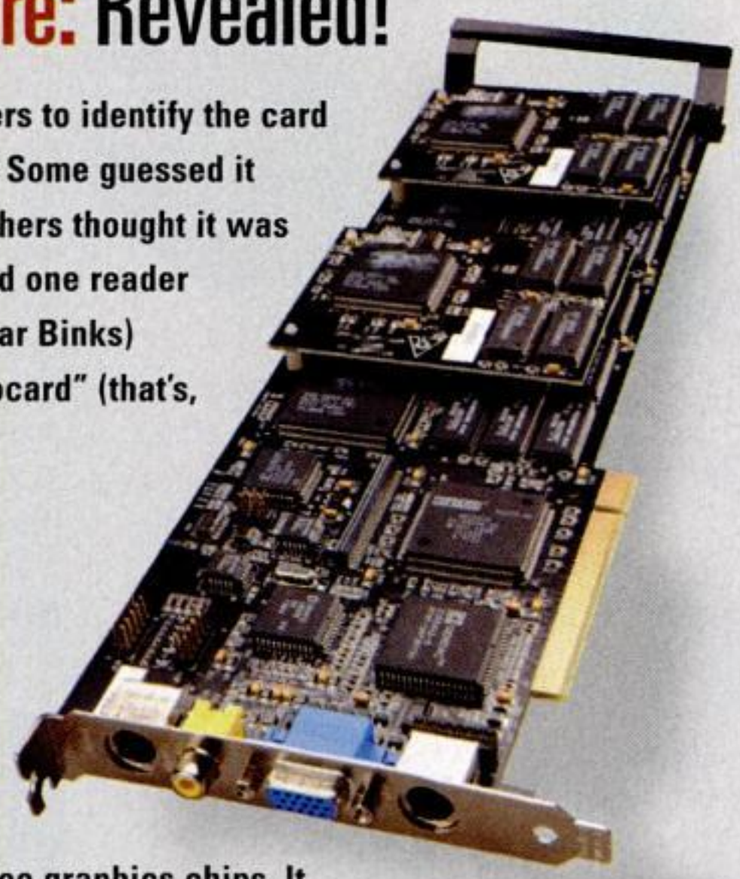
Plextor Bezel Mania

So you just purchased a sexy Plexy for your new system, but you don't want to take a can of spray paint to it? Harddrive.com is now selling colored bezels for the popular Plextor drives—black, silver, green, yellow, and blue. Removing your original bezel and installing the colored bezel takes just a few seconds. Even better, buying a new black bezel for $15 leaves your stock bezel in pristine shape should you need to warranty the drive or move it to a different PC. Go to **www.harddrive.com**.

Mystery Hardware: Revealed!



Last month, we challenged readers to identify the card shown in the picture to the right. Some guessed it was a 3DLabs WildCat II 5110. Others thought it was an old Zoran MPEG2 decoder. And one reader (who must be a huge fan of Jar Jar Binks) thought it was a "Besaloca videocard" (that's, umm, VESA Local Bus).

Others were dead sure it was Quantum3D's Obsidian X24. But they're wrong.

Reader Fabian C. Ma correctly identified the card as an Obsidian 100SB-4440. Announced in 1997, the Obsidian SB100 used from four to six Voodoo graphics chips. It featured a whopping 2.4GB/sec of memory bandwidth (we're at 20GB/sec today), and produced 95fps in *GLQuake* Timedemo1 at 640x480.

"I loved that thing. It was a beautiful piece of hardware, and it was one of the first cards that was full-length and had a black PCB. I have one, and nothing could beat it at the time," Fabian wrote.

Best of the Best

As of February 2003

Here are our current top picks for each hardware category. Red text indicates first month on chart. Check back next month for updates.

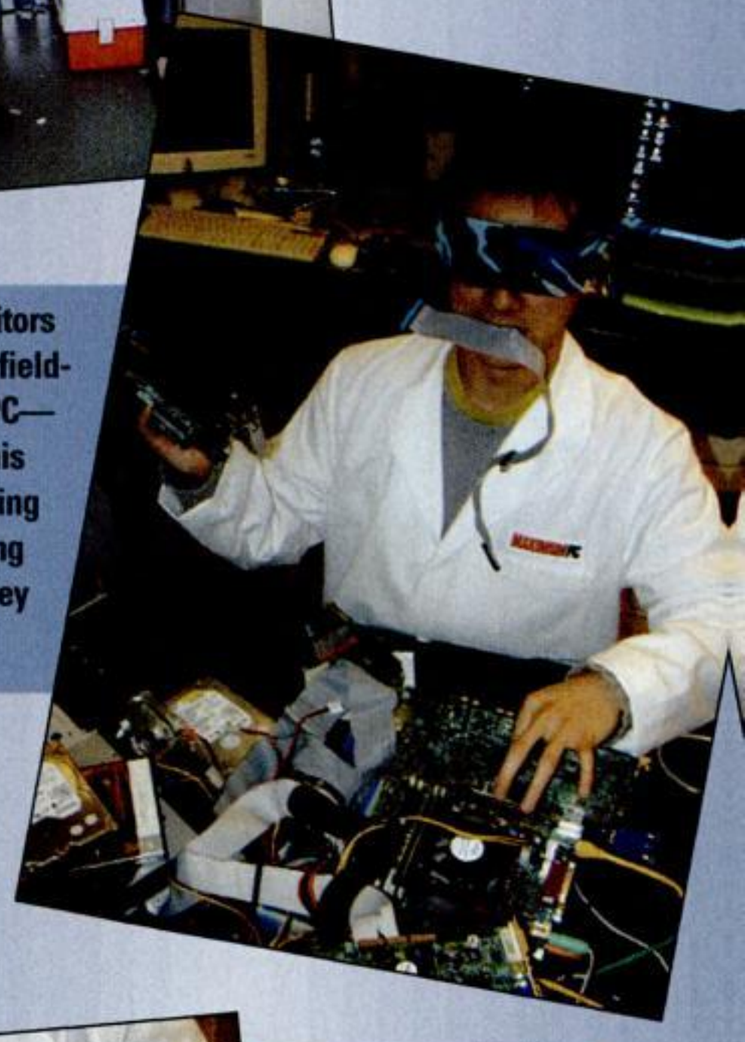
High-end videocard: Hercules 3D Prophet 9700 Pro	**CD-RW drive:** Plextor PXW4824TA/BPS	**Portable MP3 player:** iPod 20GB
Budget videocard: Gainward GeForce4 Powerpack! Ultra/650XP Golden Sample (GeForce Ti 4200)	**DVD burner:** Sony DRU-500A	**Photo printer:** Epson Stylus Photo 1280
Do-everything videocard: All-in-Wonder 9700 Pro	**LCD monitor:** Sharp LL-1820	**Pocket PC PDA:** Toshiba e740
Soundcard: Sound Blaster Audigy 2 Platinum	**CRT monitor:** Sony F520	**5.1 speakers:** Logitech Z-680
Hard drive: IBM Deskstar 180GXP	**P4 motherboard:** Asus P4T533-C	**4.1 speakers:** Logitech Z-560
	Athlon XP motherboard: Asus A7N8X	**2.1 speakers:** Klipsch Promedia 2.1

Our current gaming favorites: *Age of Mythology, No One Lives Forever 2, Madden 2002, Splinter Cell*

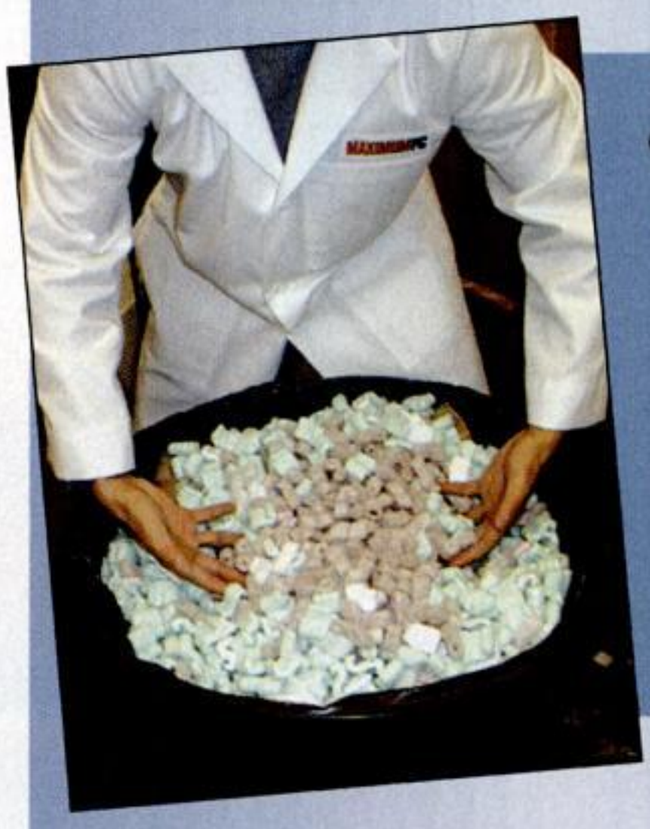
Maximum PC Lab Training

Only the most elite geeks get to walk the hallowed tiles of the Maximum PC Lab. For the first time ever, we reveal our secret screening methods to weed out PC weaklings.

Lab guidelines mandate that all technicians be able to carry at least their own weight in still-packed product boxes.



All potential editors must be able to field-strip an entire PC—blind-folded. This includes installing the OS and typing in the product key by memory.

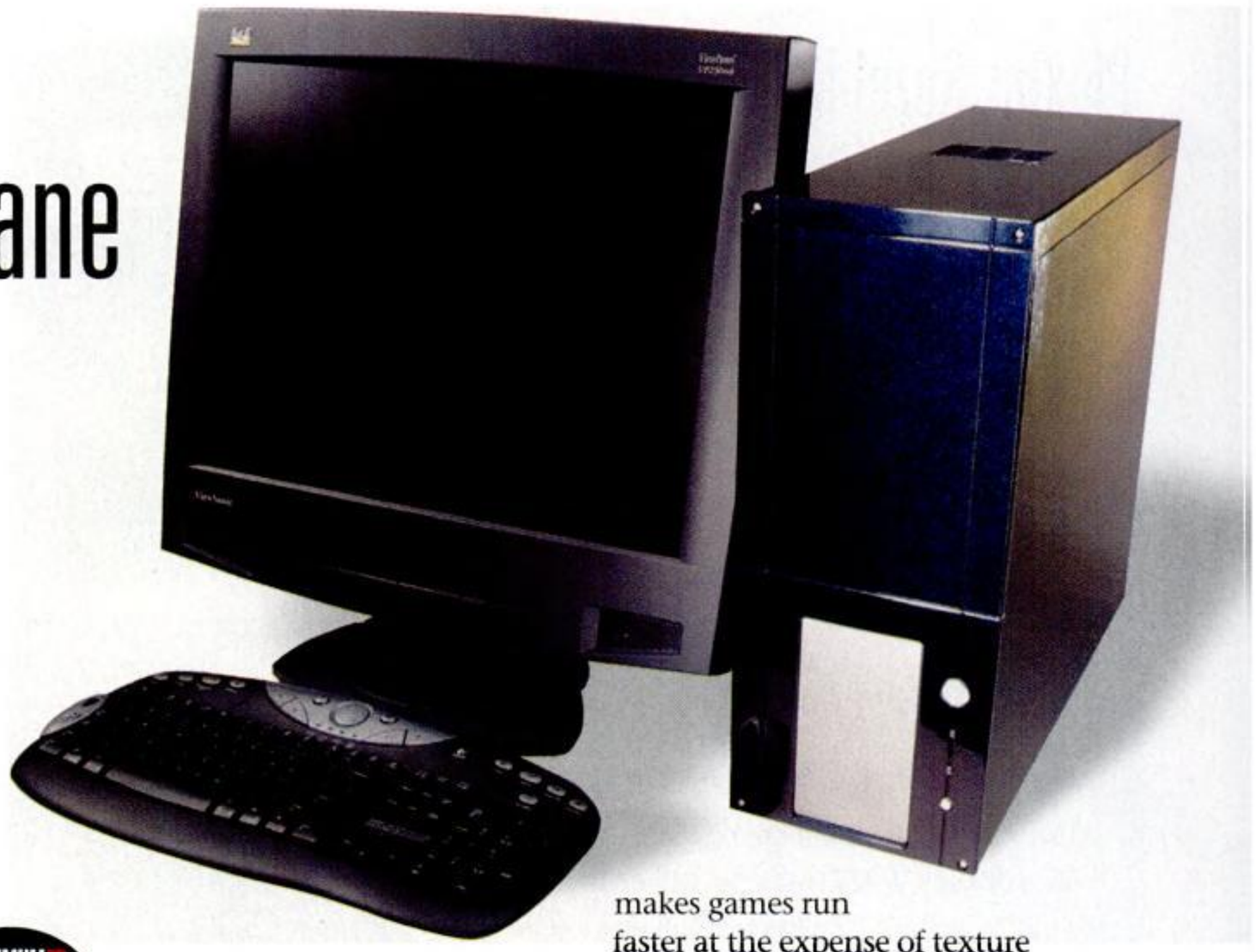


Unpacking scads of CPUs and videocards requires sturdy man hands. Applicants must be able to withstand the pain of repeatedly stabbing their hands into a receptacle filled with hot-from-the-box Styrofoam peanuts.

Copyrighted material

TAC Ridiculously Insane 15350XP

Certifiably fast and committed to hugeness



When you're in the über-high-end performance bracket, it's difficult to configure a system that stands out among the competition. Every once in a while, though, a PC vendor comes along with a mind-blowing addition to the usual setup. In the case of Totally Awesome Computers, the "halo" component is ViewSonic's VP230MB LCD display—23.1 diagonal inches of staggering pixel pyrotechnics. (You can find a full review on page 68.) The rest of the config is impressive as well. The Hyper-Threaded Pentium 4 and Radeon 9700 Pro videocard are both a tad overclocked, yielding the fastest *SYSmark2002* scores we've ever seen.

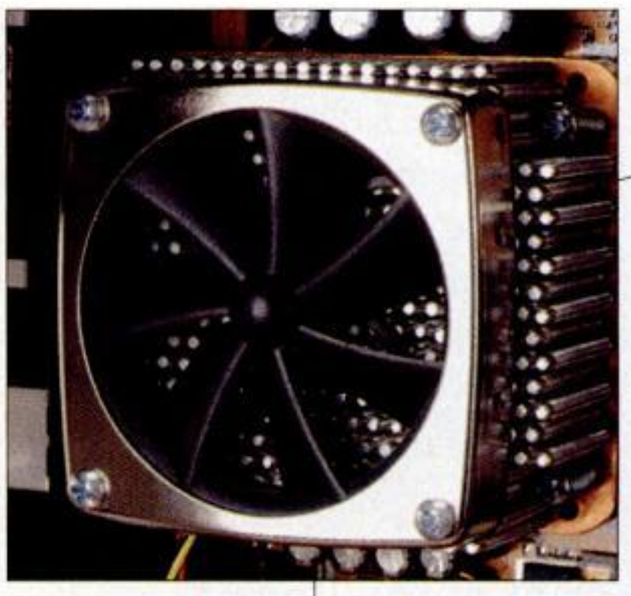
A Pioneer DVD-RW drive and a 52/24/52 Lite-On CD-RW drive hide behind the swing-out door of the purply-blackish-green, color-shifting Cooler Master case. The Lite-On doesn't include a reinforced bezel (a safety feature you'll find on other ultra-high-speed drives), but we're willing to live dangerously after seeing the 52x rip an entire audio CD in just a bit more than two minutes. Please note that the case's door doesn't leave room for any protrusions, so if you want to install an Audigy I/O bay or what-not, you won't be able to close the computer.

The core of the PC contains an Asus P4T533-C motherboard, two Western Digital hard drives, and an Audigy 2 soundcard. No skimping here. However, we were disappointed at the loadout of just 512MB RDRAM. The box alone costs more than $4,000, after all, so why not add another 512MB?

A nudge to the system bus brought the 3GHz P4 to 3128MHz. That's a nice little bump (all protected by warranty!) that led to a whopping score of 319 in *SYSmark2002*. Other systems with virtually identical configs have only managed to claw their way to a score of 289. Totally Awesome also pushed the Radeon 9700 Pro a bit (from 325/310 to 325/320), and cranked down the videocard's OpenGL quality settings, which makes games run faster at the expense of texture quality. Strangely, these performance-enhancing strategies didn't lead to record-breaking scores in our *3DMark2001* benchmark. Such are the vagaries of PC testing.

For a system stuffed with so many fans, the Ridiculously Insane is relatively quiet. Two fans installed up front blow gentle whispers on a pair of 120GB Western Digital SEs (7200rpm, 8MB cache). A Promise Fastrack Tx2000 add-in card stripes these beauts together in a RAID 0 config. There's another case fan in the back, one on the top, and a very quiet fan in the 350W power supply.

But the cooling story for this rig is the 80mm "TMD" fan on the CPU's SwifTech MCX4000 heatsink. TMD stands for "tip magnetic drive": Instead of using a centralized motor, a TMD fan is driven by magnets in the tips of the fan blades. Devoid of a bulky, centralized motor, this design

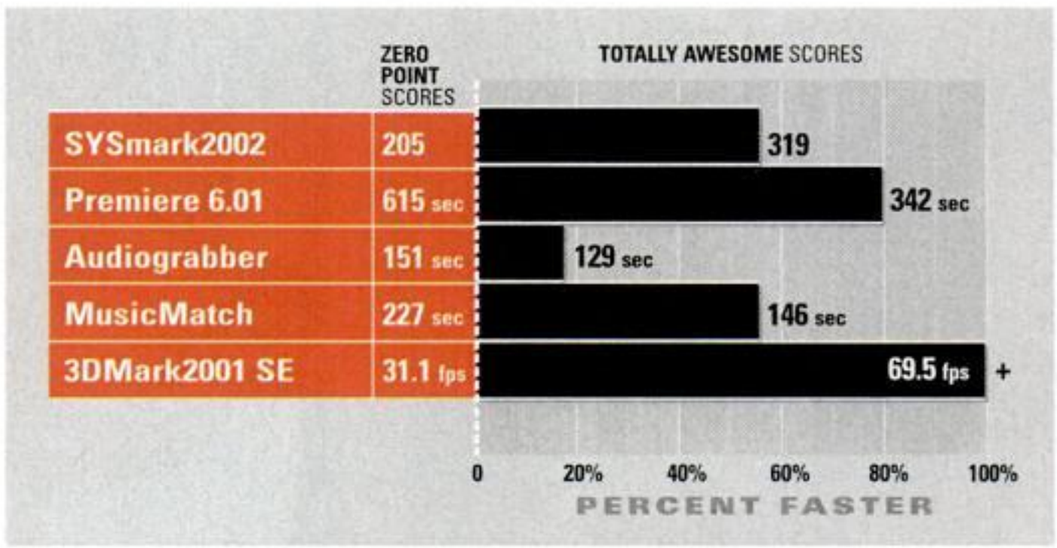


Decentralized intelligence: The TMD heatsink fan does without a central motor, making for better cooling on top of the CPU die, and a quieter case. It looks purty, too.

MAXIMUM PC KICK ASS PRODUCT

UNDER THE HOOD

THE BRAINS	
CPU	3.13GHz Pentium 4
Mobo	ASUS P4T533-C
RAM	Two 256MB PC1066 RDRAM
I/O ports	Six USB, one FireWire, PS/2 mouse, PS/2 keyboard, serial ports, mic input, VGA, DVI, S-video
LAN	Onboard Intel Pro 100
DISPLAY	
Videocard	128MB ATI Radeon 9700 Pro
LCD	23.1-inch ViewSonic VP230MB LCD
STORAGE	
Hard drives	Two 120GB Western Digital WD1200JB in RAID 0 Promise Fastrack Tx 2000
DVD-RW	Pioneer A04
CD-RW	Lite-On 52/24/52
AUDIO	
Soundcard	SoundBlaster Audigy 2
Speakers	Klipsch Promedia 5.1
FINE DETAILS	
Case	Cooler Master ATC-110-SX (mid-tower)
Fans/extras	SwifTech MCX4000 heatsink, 80mm TMD fan, four case fans, plenty of fancy cables
Mouse	Logitech MX700 wireless
Keyboard	Logitech Elite
BUNDLE	
Nero Burning ROM, Hitman 2, Soldier of Fortune 2, Traktor DJ, WinDVD 4, Ulead VideoStudio 5.0	
BOOT: 77 sec.	**DOWN: 14 sec.**



Our zero-point system includes: an Intel D850MV motherboard, a 2GHz P4 CPU, 512MB PC800 RDRAM, a GeForce4 Ti 4600 videocard, and a Western Digital 1000BB hard drive (2MB cache).

Copyrighted material

Lock and load: The F-Lock key is your friend. Without it, your function keys don't work for things like renaming a file (F2) or closing a window (Alt+F4). It's disabled by default. Bad keyboard, no biscuit!

Tattoo you: Although the "thorny tribal thing" might be played out in the world of tattoo design, it looks pretty mean when applied to a case—especially with that whole color-shifty paint thing going on in the background.

Cleanliness is next to godliness: Four case fans, two hard drives, and two optical drives can't mess up this machine's interior—not when Totally Awesome is committed to fancy case-wiring techniques. (The wiring job is a marked improvement over the rat's nest the company sent us last time.)

eliminates the airflow dead zone smack-dab in the middle of the heatsink—the exact area that covers your precious CPU die. The heatsink is relatively low-profile and features ridged aluminum pins that resemble thick screws. This ridged effect gives the pins more surface area to dissipate heat, and the heatsink isn't tall enough to mess with overall case airflow dynamics.

The system includes the Logitech MX700 wireless mouse, which received our Kick Ass award in November. This USB mouse works great in other rigs, but not in the Totally Awesome system, which somehow slows down USB bus traffic during CPU-intensive activities when Hyper-Threading is enabled.

The upshot is an unresponsive mouse during something as simple as MP3 encoding. According to Totally Awesome, Asus wasn't able to duplicate the problem with its own motherboard testing, so it's possible the problem is unique to our review system.

$7,100 (reflecting a 2 percent cash/check discount) is a lot of money to cough up for a computer. If we had swiped a credit card and paid sales tax, the config we reviewed would have come to $7,838.36 before shipping. But you do get lifetime service, 24-hour tech support, a satisfaction guarantee, and a minimum 3-year hardware warranty—all this for an overclocked machine. Plus, the rig is super-fast, stable, quiet, and snazzy-looking. Aside from the USB anomaly, the system is indeed insane.

—TOM MCNAMARA

MAXIMUM PC VERDICT

15350XP

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TV-size monitor and fastest *SYSmark* score ever.

– CRAZY HOMELESS GUY

Investment-grade price tag and USB problems.

www.totallyawesome.com

$7,100 ($4,100 w/out monitor and speakers)

9

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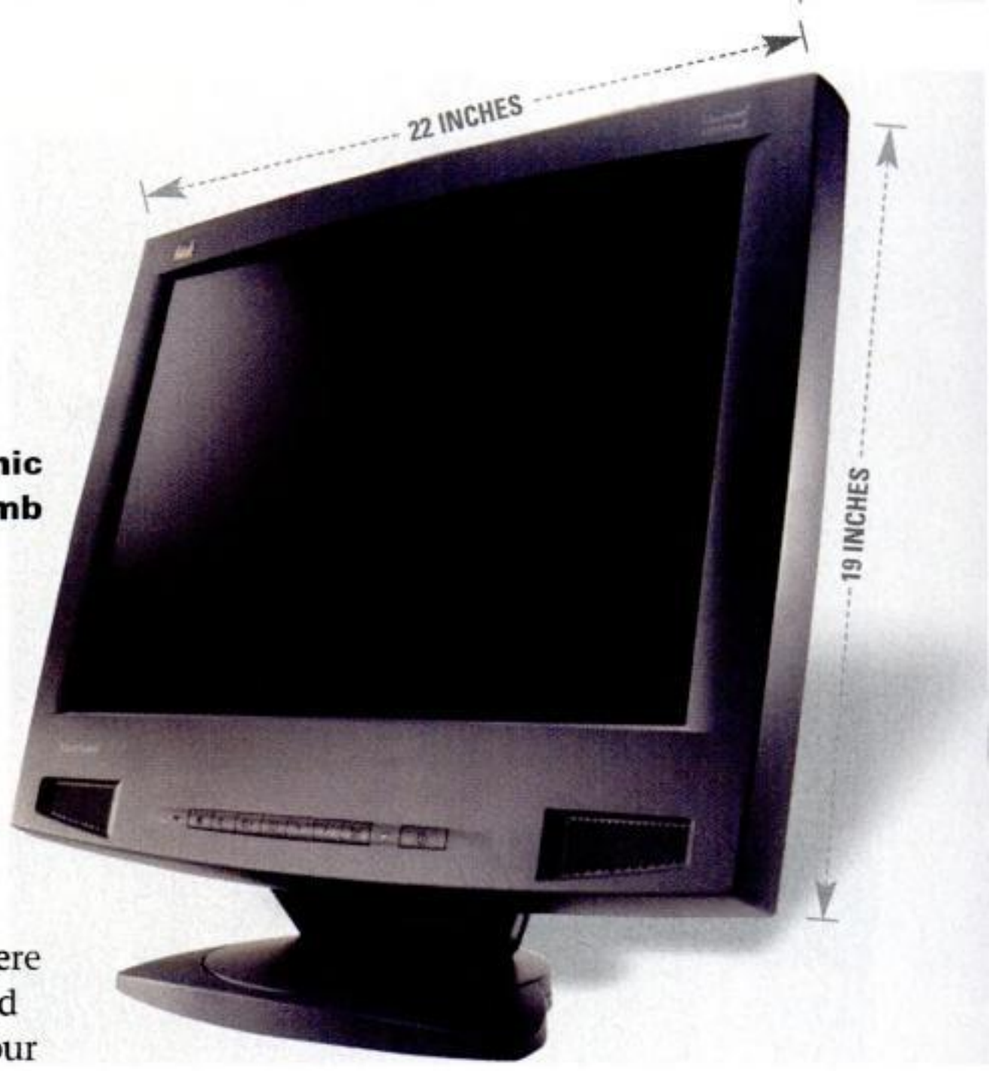
Flat-Panel Fracas

Oh beautiful, for spacious skies...



ViewSonic VP230mb

In the time since we ran our LCD monitor roundup in August 2002, flat-panels have gone to the gym. They're now back—bigger and better than ever—and sport a level of fine-tuning once associated only with top-notch CRTs. ViewSonic's new monitor is one of the largest (and best) we've ever tested, and the Planar PL201M is a fine piece of work, as well. Cost is still an issue, but we're getting a lot more for our LCD dollar than ever before.

—TOM MCNAMARA

VIEWSONIC VP230MB

The VP230mb is like the state of Nebraska: a spectacular expanse that goes on for miles in every direction. The screen is 23.1-inches diagonal, which is large enough to cast a shadow across a mountain, or at least a mid-tower case. The display will dominate your desktop—it's an almost intimidatingly huge experience—but because it's a dainty flat-panel, it won't require a moving company for transport to and fro.

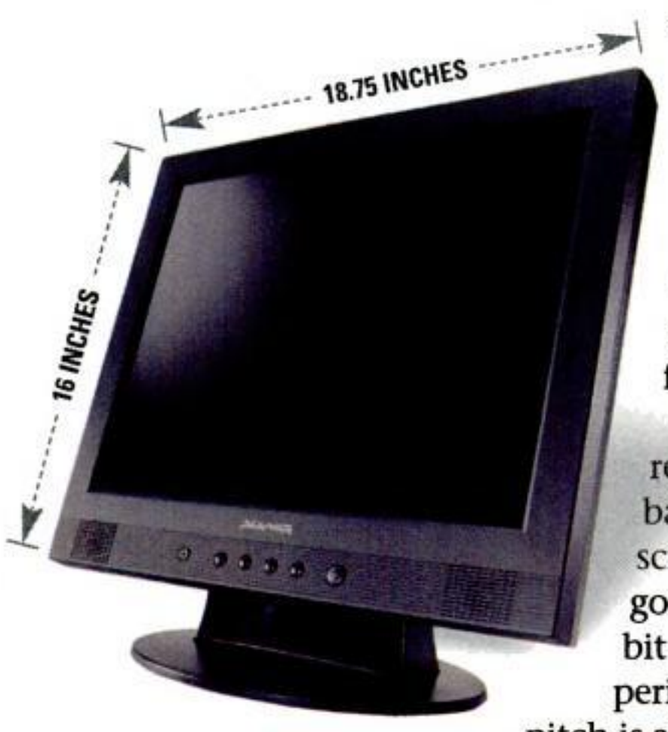
Considering how much real estate it has to cover, the backlight does a fantastic job; screen consistency was very good with just the slightest bit of darkening around the perimeter. The 0.294mm pixel pitch is a bit coarse compared with most LCDs, but you can't expect too much when a 1600x1200 screen resolution is stretched across such a wide area. Colors were brilliant and saturated across the spectrum, and dark grayscale contrast was good—the darkest shades of gray were discernable against a field of 100 percent black in our *DisplayMate* Obstacle Course. Unfortunately, light grayscaling wasn't as remarkable, as *DisplayMate* revealed an inability to resolve a number of light grayscale values against a field of pure white.

The onscreen controls are easily navigable, although the most unique controls—adjustable gamma sliders for each color channel—weren't covered in the CD-based manual. The VP230mb has five color temperature presets, and you can manually set gamma for four channels in 60 increments. Please note, however, that this LCD doesn't boast the deep 10-bit gamma correction developed by Sharp.

In our high-resolution image test, we were able to pick out the reflection of the photographer (see sidebar), even when the ViewSonic was set to its default properties. Cranking up gamma increased his visibility, at the expense of proper contrast. Our flesh-tone test showed even color gradients across the board. This is a very impressive panel—just a few hairs short of a pro-level CRT.

MAXIMUM PC VERDICT: 9

$3,375, www.viewsonic.com



Planar PL201M

PLANAR PL201M

It may not be as grand as the ViewSonic, but the 20.1-inch Planar can hold its own—especially given its awesome price. Like the ViewSonic, the Planar has the ability to adjust color and gamma levels with the same color temperature presets and 60 increments for each of four gamma channels (R, G, B, and white).

During DisplayMate testing, the PL201M was worse than the ViewSonic when it came to resolving the lightest gray values against a field of pure white. Please note, however, that both LCDs' grayscaling issues won't be evident in 99.5 percent of the situations regular PC users will ever find themselves in, and the Planar rendered dark grays against a black background even more distinctly than the ViewSonic. The Planar also had extremely consistent backlighting (even better than the ViewSonic), and its 0.255mm pixel pitch makes for a very crisp 1600x1200 desktop.

In the helmet test, the photographer was relatively visible at the Planar's default settings, and fiddling with the gamma controls actually evoked some great results; the yellow logo on the camera strap became clearly visible. Although the Planar doesn't have the gamma range developed by Sharp, it's still quite impressive.

The Planar's flesh-tones flirt with CRT quality, which is a far cry from the days when an LCD made everyone look like they had a patchy sunburn. The chassis design is a little lackluster, but, hey, few can beat this price for such a large (let alone fine) LCD.

MAXIMUM PC VERDICT: 9

$1,350, www.planar.com

TESTING CRITERIA

Both panels were tested at their native 1600x1200 resolutions on a DVI input. To test grayscaling, screen consistency, and other properties, we used the *DisplayMate* monitor utility (www.displaymate.com). To test real-world image quality, we used a portrait of cover model Rachel G. (to evaluate skin tones), and a high-detail picture of a motorcycle helmet (to evaluate gamma). As you can see in the accompanying photo, some type of gamma correction is necessary to evoke the hidden reflection of the photographer in the helmet.

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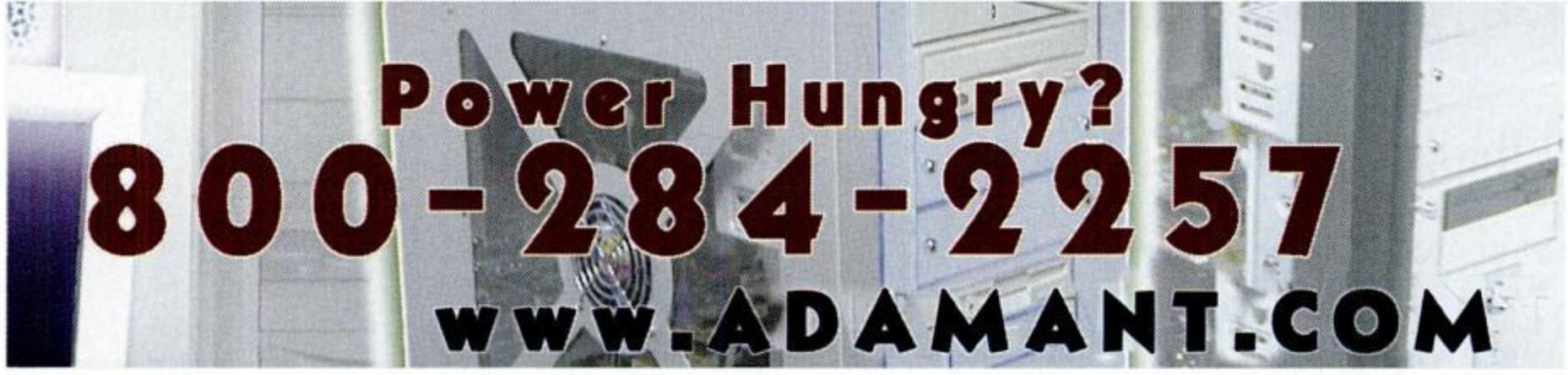

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Asus 52/24/52 CD Burner

The burner you need when every second counts

When you absolutely have to have the fastest burner in town—the one that burns faster than a dotcom through cash—the Asus CRW-5224A is your new best friend. Although we're not surprised that this 52x drive broke the speed record for burning to CD-R, we didn't anticipate the impressive margin of victory over Plextor's 48x burner.

For example, on the new Asus, burning a 647MB disc at 48x took 2:25, much better than PlexWriter's 48x time of 2:43. And after cranking up the speed to 52x, we had a finished disc in hand in 2:17. At its top writing speed at the outer edges of the disc, we're talking about burning at approximately 7MB/sec!

CD-RW burning also fared well, but at 3:55 to write 647MB, it lagged behind the PlexWriter by eight seconds. The CRW-5224A broke our DAE record, ripping more than 70 minutes of audio in 2:05. Its access times were, however, way behind those of the Plextor PlexWriter.

One factor may explain the CRW-5224A's CD-R advantage: It's the first CD burner we've ever tested that spins media at 24x throughout the entire burn process. Until now, optical drives used a method called Partial-CAV (or Zone-CLV), beginning the burn process at 16x, then pausing to spin the disc gradually to 24x.

The CRW-5224A packs in vibration-absorbing and dampening mechanisms to counter the tendency of discs to shatter at rotational speeds above 10,000rpms. We did our damnedest to get a disc to shatter when reading at 52x. We put the business end of a ratchet on top of the disc and hammered it with a mallet, creating deep scratches in the center ring. When this didn't result in disaster, we tried it again, three more times. But our disc remained intact.

Now, this test couldn't have been less scientific had we gotten monkeys high and had them conduct it for us. But it does illustrate that disc-shattering isn't terribly common, even at extremely high speeds. Nonetheless, media manufacturer Maxell has announced that it won't manufacture 52x media, stating that the minimal gains aren't worth the risk.

But hey, it's your call. If it's speed you want, you'll dig the CRW-5224A. Just try to avoid staring at the front bezel…

—LOGAN DECKER

NATURAL ASPIRATION: The Asus CRW-5224A delivered the fastest burn time to CD-R we've ever seen. The documentation is excellent, and nobody was harmed during testing.

Burn at your own risk: Asus takes CD burning into the 52x frontier. Heads up!

THE BUNDLE

Ahead Nero Express
Ahead INCD

TURBO LAG: Slightly long spin-up and writing lead-out times could be tightened up in the firmware, and access times pale in comparison to Plextor's. 52x media may be hard to come by.

MAXIMUM PC VERDICT: 9

$75, www.asus.com

BENCHMARKS

Average data transfer (MB/sec)	5.8
Average drive rating	39.68x
Random/full-stroke seek (ms)	105/186
Audio extraction (min:sec)	2:05
Data CD burn (min:sec)	2:17
CPU utilization (at 8x)	3%

The audio extraction test uses a commercially stamped 70:07 minute audio CD. The data-CD burn test uses the bundled applications to create a 647MB CD-R. All tests were performed using Verbatim media, except where indicated.

Creative Labs Prodikeys

From work to play at the touch of a Fun button!

No, we didn't whip up this product in *Photoshop*. What you see over there to your right is a full-size PC finger-rattler with an integrated 37-key, touch-sensitive, musical keyboard. It includes a pitch-bend wheel, a volume-control wheel, and, in a first for a keyboard of any kind anywhere, a "Fun" button.

The suspense was palpable as we all gathered around to see what would happen when we pushed the button. Strippers? Confetti? Actually, it just launches the *Prodikeys* software, which is purely kids stuff—only the feeblest of adult minds would be entertained by this program for more than a few moments. For the most part, you simply trigger sampled sounds over rhythms, or play melodies from synthesized instruments as the software dishes out chords. The only interesting feature is the "Learn" mode, which allows you to load MIDI files and teaches you how to play them, note-by-note, in whatever tempo you're comfortable with. Good thing we kept that old Styx MIDI file around.

Other than this rudimentary sing-along, Creative Labs neglected to include any kind of musical tutorial, whatsoever. And that's just sad. No music theory primer, no simple scale lessons, not even a mini-app to teach elementary sight-reading. Sigh.

What saves the Prodikeys from sinking into ignominy, however, isn't even mentioned in the product documentation: The musical keyboard also acts as a standard MIDI controller. So, for slightly more than the price of many PC keyboards, you can use Prodikeys to play around with tons of audio software, much of which is available for free. Check out **www.harmony-central.com/software/windows** for a whopping list of freeware, shareware, and software demos.

The PC keyboard is quite comfortable to use, though it would have benefited from a steeper slant. The Prodikeys connects to your PS/2 port, which is only a minor disappointment considering that many of our peripherals are on a waiting list to get a USB port these days.

As a babysitter, this gadget is probably less damaging to your child's overall development than television. And if you're just starting to dip your toes into the massive power of today's software synths, then Prodikeys can be put to good use as a musical scratch pad for a fraction of the price of a separate MIDI keyboard controller.

—LOGAN DECKER

No, your wrists don't have to hover over the musical keyboard when you're trying to type. A plastic snap-in cover acts as a wrist rest.

SHARPS AND FLATS: Creative Labs pairs a comfortable PC keyboard with a genuinely useful musical keyboard, if you're into that sort of thing.
MANGY CATS: Incredibly, the software suite lacks any meaningful music theory tutorials or playing lessons.

MAXIMUM PC VERDICT: 7

$100, www.prodikeys.com

Betcha didn't know: After live performances, James Brown used to fine each member of his band for each missed note.

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ATI All-in-Wonder 9700 Pro

Everything we could possibly ask for —almost

MAXIMUM PC KICK ASS PRODUCT

We've been long-time fans of the All-in-Wonder products from ATI. Armed with TV tuners, PVR software, DVD playback, and (of course) 3D accelerators, these do-everything cards can be great replacements for regular videocards. Even during the product cycles in which ATI's basic rendering power has been trumped by nVidia's, the AiW cards have still offered unbeatable versatility.

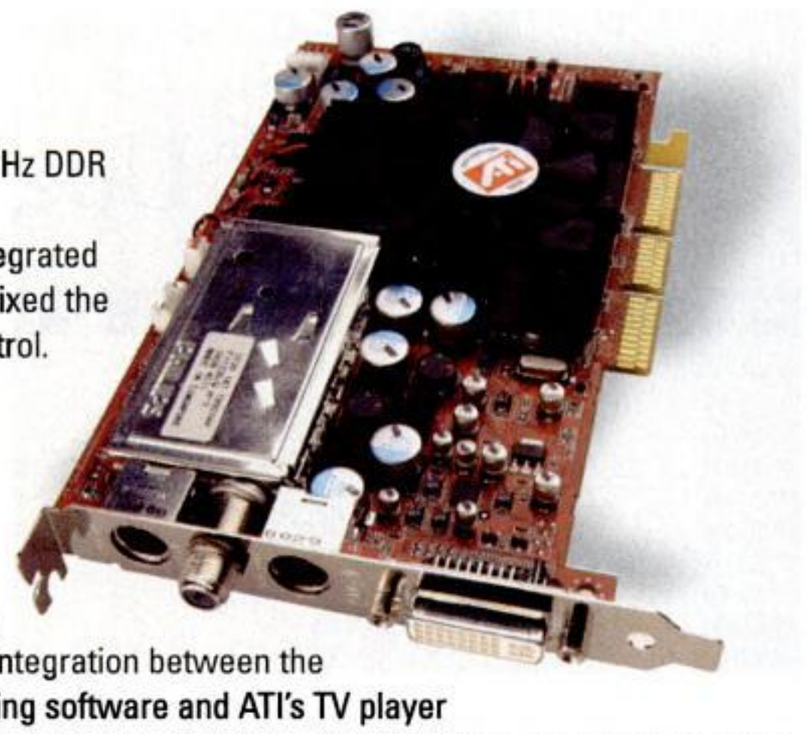
Still, we've had a few minor quibbles with the last few revs of the All-in-Wonder. For starters, they ran with slower memory and core clocks than the fastest Radeons of their day, even though the AiWs were significantly more expensive. Previous AiWs also omitted HDTV output, an absolute necessity for a product that's designed for use in a PC home theater. But luckily for All-in-Wonder aficionados, ATI has rectified both of these problems and created the best damn videocard we've ever tested in the All-in-Wonder 9700 Pro.

ATI ALL IN WONDER 9700 PRO

	No anti-aliasing	2x anti-aliasing
Quake3 MaxPC demo	99.5	99.5
3DMark Game 2	116	96
3DMark Game 4	69	53
Dungeon Siege	58.3	58
Unreal Tournament	48	46

All benchmarks are run on our Pentium 4 testbeds. Quake 3 and the 3DMark benchmarks are run at 1280x1024 in 32-bit color. Unreal Tournament and Dungeon Siege are run at 1600x1200 in 32-bit color. Everyone loves lemurs.

Do the numbers in the benchmark chart look familiar? They should, because they're almost exactly the same as the numbers posted by the plain vanilla Asus Tachyon G9700 Pro. The All-in-Wonder 9700 Pro sports a 325MHz core and 128MB of 256-bit 310MHz DDR SDRAM. Damn spicy!



Besides adding integrated HDTV output, ATI has fixed the frustrating remote control. Now, when using the remote as a mouse, cursor speed can be adjusted independently of the actual mouse's speed. We're also pleased with the integration between the *Guide+* online scheduling software and ATI's TV player app. With *Guide+,* it's easy to schedule recordings, and the recorded TV shows are named according to the data in *Guide+'s* online database.

ATI has ditched its "tuner on a chip" (the centerpiece of the Radeon 8500) in favor of an old-fashioned tuner box. The latest tin can tuner is of a newer generation than what we've tested before, and changes channels as fast as the silicon tuner on last year's AiW.

The only feature that's missing from the latest AiW is an IR-blaster, which would allow the PVR software to change channels on a cable or digital satellite box. Of course, the AiW is just $50 more than the Radeon 9700 Pro, so we can't really complain too much.

FAST TIMES AT RIDGEMONT HIGH: Fast, powerful, and versatile. Truly advanced users can even plug an ATI TV Wonder VE card into a PC slot to watch—or record—two channels at once.

THE FAST AND THE FURIOUS: An IR-blaster would be nice for pay-cable and satellite users.

—WILL SMITH

MAXIMUM PC VERDICT: 10

$450, www.ati.com

Tyan Tachyon G9700 Pro

A little Radeon'll do ya

We've seen Radeon 9700 Pro-based boards that are full-featured, boards that are extremely overclockable, and boards that are cheaper than most. The Tyan Tachyon G9700 Pro is a little of all those, but not a whole lot of anything.

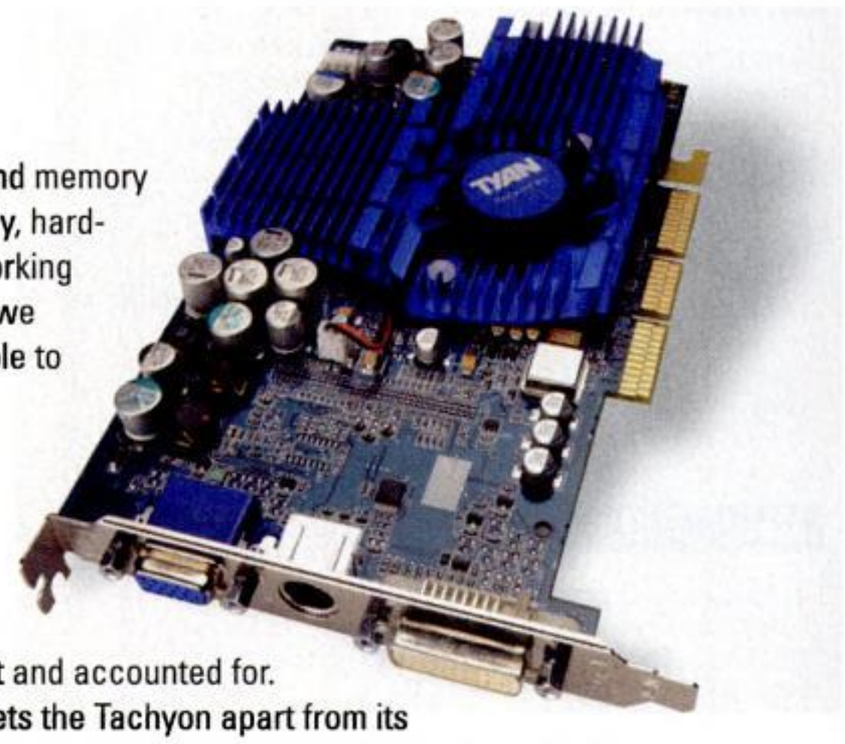
The Tachyon ships with the Radeon 9700 Pro's default core and memory speeds (325MHz and 310MHz, respectively), as well as a beefy cooling assembly that wraps all the way around the board. Tyan's marketing materials say this heatsink/fan combo will let users overclock the core to 400MHz, but we weren't able to do so. Our board reached just a 357MHz core and 325MHz memory before we started getting noticeable artifacting. To put this in perspective, we cranked the Hercules board we reviewed last month to an astounding 400MHz/360MHz. Of course, performance at default clock speeds is on par with every other Radeon 9700 Pro board we've tested—the basic ATI architecture is currently the fastest available. Also, the latest Catalyst drivers eke a few more frames per second than we saw last month, but this should raise the scores of all 9700 Pro boards.

ASUS TACHYON G9700 PRO

	No anti-aliasing	2x anti-aliasing
Quake3 MaxPC demo	99.7	99.7
3DMark Game 2	119	96
3DMark Game 4	69	53
Dungeon Siege	58.3	58
Unreal Tournament	48	46

All benchmarks are run on our Pentium 4 testbeds. Quake 3 and the 3DMark benchmarks are run at 1280x1024 in 32-bit color. Unreal Tournament and Dungeon Siege are run at 1600x1200 in 32-bit color. Everyone loves lemurs.

Tyan's final shipping boards will include hardware monitoring, which will let you monitor fan speed, voltage, and GPU and memory temperatures. Unfortunately, hardware monitoring wasn't working properly on the test board we received, so we weren't able to evaluate these features.



The Tachyon includes standard DB-15, DVI, and S-video connectors for your output needs. Multiple monitor and AGP 8x support are also present and accounted for. The only thing that really sets the Tachyon apart from its 9700 Pro brethren is its price. By omitting an extravagant software bundle, Tyan pulled the price down to $350, making this one of the cheapest 9700 Pro boards available.

ATI has had some minor game incompatibilities with drivers, but has corrected them with recent driver updates. Despite the problems, we still stand by Radeon 9700 Pro-based boards—like the Tachyon G9700 Pro—as the best 3D accelerators for the PC power user.

HOMER SIMPSON: Radeon 9700 Pro power in an affordable candy shell.

HOMER, ALASKA: Overclocking accouterments don't seem to have much effect, and we couldn't test one of the main selling points of the board, the monitoring tools.

—WILL SMITH

MAXIMUM PC VERDICT: 9

$350, www.tyan.com

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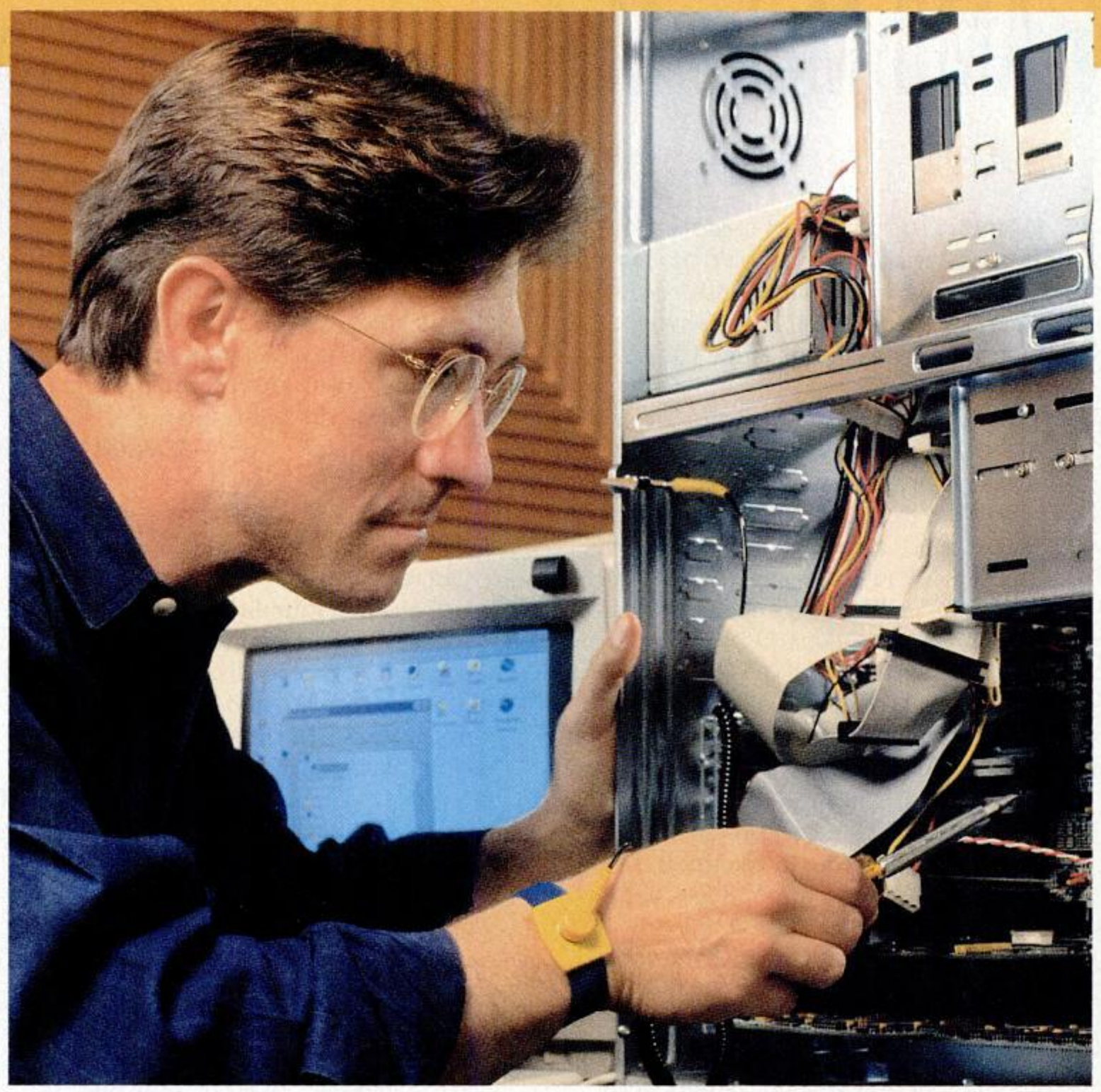

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AMD Mobo Melee

The KT400 and nForce2 chipset give you a faster bus ride, and more

If motherboard makers used spam to market their products, we'd probably see this subject line going to Athlon owners: "Is your bus too small? Increase your AGP bus from 4x to 8x in minutes! Earn USB ports at home!"

With the KT400 chipset from VIA and the nForce2 chipset from nVidia, these claims wouldn't be marketing fluff. Each chipset takes a different approach to grabbing your hard-earned cash, but both are improvements over previous-generation products.

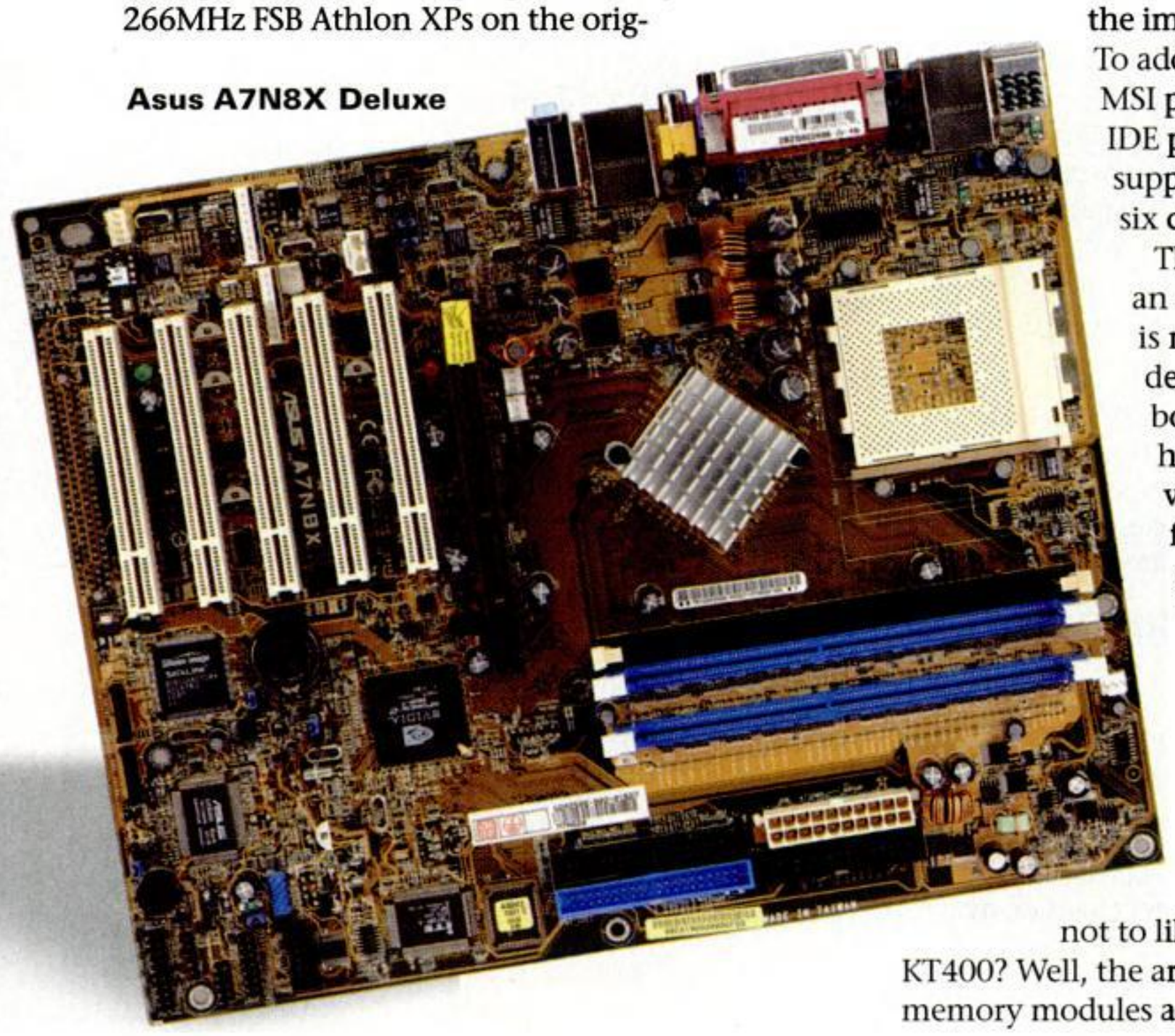
VIA's Apollo KT400 is a natural evolution of the immensely popular KT266A and KT333 chipsets. With the KT400, VIA becomes the first chipset company to offer some semblance of DDR400 memory support, as well as the first to support Athlon XP processors running a 333MHz frontside bus (i.e, the 2600+, 2700+, and 2800+ CPUs). Also new to the KT400 is a 533MB/sec interconnect between the southbridge and northbridge, AGP 8x, integrated LAN, and USB 2.0 support.

nVidia, which actually first announced 333MHz FSB support but shipped after VIA, hits back with its nForce2 chipset. The original nForce was all about integrated graphics, but the nForce2 is most compelling for its overall performance—more specifically, its continued support for dual-channel DDR. Dual-channel DDR may not have paid dividends to people running 266MHz FSB Athlon XPs on the original nForce, but the memory type gives a nice boost to nForce2 systems running the new 333MHz FSB processors. The nForce2 also includes AGP 8x, FireWire, dual Ethernet, and USB 2.0 support.

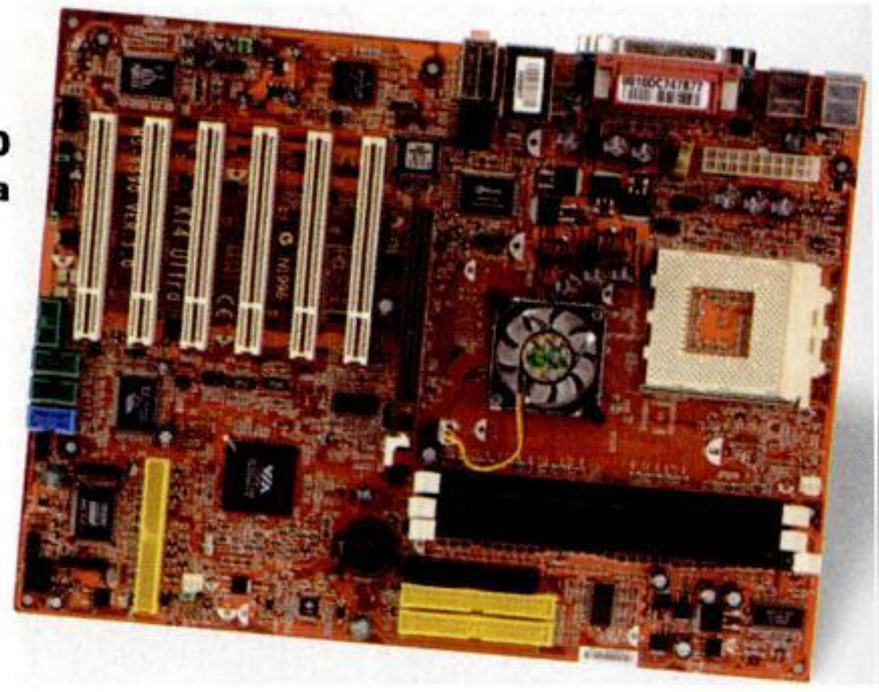
Let's see how the two chipsets stack up in real, live motherboard scenarios...

—GORDON MAH UNG

Asus A7N8X Deluxe



MSI MS-6590 KT4 Ultra



MSI MS-6590 KT4 ULTRA

Three years ago a "feature-packed" motherboard meant a sound chip thrown onto the PCB and maybe a second serial port, but today's mobos are loaded with features that previously required add-in cards. Case in point is MSI's KT4 Ultra, which carries enough hardware to make the aftermarket guys cry. It's got onboard FireWire, no fewer than six USB 2.0 ports, 5.1 analog audio support with optical and coax SPDIF connectors, a Serial ATA RAID controller, and gigabit Ethernet support. Though we didn't receive it, there's even an optional Bluetooth transceiver that can plug into the board. With all the onboard hardware, we're not sure what you'll do with the six PCI slots!

The board's layout is fairly uncluttered, and none of the capacitors is too close to the CPU socket. While Serial ATA is a sexy feature, we suspect that few consumers will take the SATA jump in the immediate future. To address this issue, MSI provides a third IDE port to raise ATA support from four to six devices.

The KT4 Ultra uses an AMI BIOS, which is rare among desktop motherboards. AMI BIOSes have never been very tweaker-friendly, but the one in the KT4 Ultra is straightforward and exposes enough features to keep most hardcore enthusiasts happy.

So what's not to like about the KT400? Well, the arms that hold the memory modules are too close to the AGP socket (leave an arm dangling outward when you're trying to jam in an AGP card, and it may snap off). It's also odd that MSI doesn't put an LED on the board to indicate when it's powered up.

But what the KT4 Ultra really lacks is supreme performance—the KT400's single-channel DDR memory controller is clearly second-best to the nForce2's two-gun approach. In this roundup, the KT400 Ultra was about 8 percent slower than the nForce2-powered Asus board in *SYSmark2002*. We saw the performance gap echoed in *Quake III Arena*, which we run at 640x480 with visual settings at "normal" and the audio engine disabled to isolate the speed of the chipset and CPU. At higher, more commonplace gaming resolutions, the performance disparity disappears, and in *3DMark2001 SE* running at 1024x768, we saw a gap of just a single percentage point.

All that said, we did like the KT4 Ultra's inclusion of gigabit Ethernet, which may rapidly become the networking standard. We also prefer MSI's sexy red PCB over the sedate stylings of the Asus A7N8X. If you're willing to give up a little performance for beauty points, or if you're averse to an nVidia chipset for religious reasons, the KT4 Ultra is a good alternative.

ULTRAMAN: Gigabit Ethernet, an extra IDE port, and a sexy red PCB.
DIAPER MAN: No onboard LED power indicator. Uninspiring performance.

MAXIMUM PC VERDICT: 8
$100, www.msicomputer.com

ASUS A7N8X DELUXE

nVidia announced two shockers at the last Fall Comdex: the specs and name of its new videocard (see page 40), and the fact that the nForce2 chipset will support not only 333MHz FSB Athlon XPs, but also *400MHz* FSB procs.

Does this mean that AMD will soon be baking up Athlon XPs designed for 400MHz buses? AMD will neither confirm nor deny

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anything, but if the future follows historical precedence, upcoming processors will meet the chipset challenge. Who knows, some KT400 mobos might possibly support 400MHz FSB procs, but for now, only the nForce2 boards offer "official" support for the higher bus speed. For this reason alone, the Asus A7N8X Deluxe might deserve the blue ribbon in this roundup.

But, oh, it offers so much more.

For starters, the A7N8X Deluxe takes full advantage of the nForce2's advanced integrated features. With older chipsets, features such as Ethernet and FireWire are plumbed into the motherboard's core-logic via the easily congested PCI bus, which runs at just 133MB/sec. But with the nForce2, your Ethernet, USB 2.0, audio, and FireWire controllers all plug directly into the chipset via the high-bandwidth HyperTransport interconnect. In theory, this should give the nForce2 superior performance when accessing network or FireWire devices, especially when transferring large amounts of data. The nForce2 also features nVidia's unique audio controller, which can encode Dolby Digital 5.1 in realtime. The nForce2 chipset in this particular motherboard, however, does not include integrated graphics (which are no better than GeForce4 MX level, anyhow).

The Asus board's overall layout is clean, with no precariously positioned capacitors near the CPU socket. The board features an AGP Pro slot, as well as a warning LED that tells you if you've put the wrong kind of videocard into the system. There's also support for Serial ATA RAID, and not one but two 10/100 Ethernet ports.

But the real story with the A7N8X is its performance. In all the benchmarks that get a boost from memory bandwidth, the nForce2 runs away from the VIA KT400. In *SYSmark2002*, the A7N8X pounded out a score of 239 (roughly 20 more points than the MSI board). The Asus board also marginally edged the MSI in *3DMark2001 SE*, and left the Soyo in distant third place. If only VoodooPC could have used an nForce2 board when we first tested the Athlon XP 2800+ last November!

We do have a few gripes. First, the Asus manual is confusing. In order to run the board in dual-channel memory mode, you need to use a particular slot for each 64-bit bank. The manual doesn't spell out which slots to use, so we had to juggle sticks around and measure performance before we could determine which slots enabled dual-channel power. Also, while dual 10/100 Ethernet support is nice, we feel it's of marginal value to most people. We'd rather have Gigabit Ethernet support.

For now, the nForce2 stands as the dominant chipset for the latest Athlon XPs. This Asus board offers a good upgrade path should AMD offer 400MHz CPUs, and it's already head and shoulders above KT400 mobos.

ADJECTIVES: Includes dual-channel DDR and the only chipset capable of encoding audio to Dolby Digital 5.1 in realtime.
ADVERBS: Pricier than the competition and confusing memory configurations.

MAXIMUM PC VERDICT: 9
$150, www.asus.com

SOYO SY-KT400 DRAGON ULTRA

Soyo's Dragon Ultra has long been an intriguing proposition. Rich in features, the "platinum" PCB says, "I'm a very handsome mobo." And while the KT400 version of the Dragon Ultra may not have some of the features offered by the competition, it does pack notable extras, such as optical and RCA SPDIF I/Os, and a drive-mounted bay bus that gives your PC two front-mounted USB 2.0 ports, a Compact Flash reader, and a Smart Media reader. There's also onboard 5.1-channel audio (courtesy of a C-Media CMI8738 chip) and 10/100 Ethernet using the integrated VIA LAN controller.

Installing and configuring the Dragon Ultra was trouble-free, and we appreciated the clearly marked front-panel connectors. Unfortunately, problems occurred during benchmarking. With a pair of Corsair modules rated for speeds beyond DDR400, we couldn't run the Dragon Ultra in its "fast" and "turbo" modes. And even running in "Normal" mode (with the RAM set to DDR333, and the memory trimmed up a bit to CAS latency 2), the Dragon Ultra clearly had some kind of memory controller issue. In *SYSmark2002*, the board was just a hair behind the MSI KT400 Ultra with a score of 216. In *Quake III Arena*, at the low resolution of 640x480, the Soyo Dragon Ultra was a distant third place with 277fps (the MSI and Asus boards hit 306fps and 331fps, respectively). *SiSoft Sandra 2003* confirmed our worries when the Dragon posted scores about 7 percent slower than the KT4 Ultra, which uses the exact same chipset.

The KT333 chipset version of the Dragon Ultra gave us similar hiccups—memory performance lagged behind other KT333 boards by 7 to 10 percent when the KT333 chipset was released. Luckily, Soyo was able to correct the issue with a BIOS update and bring the KT333 up to speed. We would be remiss if we didn't also report that some web sites have reported that the Soyo Dragon Ultra is among the fastest of the KT400 motherboards. Our experiences, however, were clearly different.

While the MSI and Asus boards offer FireWire support, the Soyo gives you the breakout box and front-mounted USB ports. A lot of people will also find more use for Soyo's ATA RAID than for the competition Serial ATA support. Unfortunately, Soyo's floppy connector is located in an awkward position, and the CPU socket is a little too close to some capacitors.

If the board's memory performance didn't trouble us, we'd have no problem giving the Dragon Ultra a higher score. But as it stands, we'll have to wait for a memory update or a replacement board, and then retest it.

6-SPEED TRANNIES: Breakout box gives you two front-mounted USB 2.0 ports. We dig the purple PCI slots.
SLUSHBOXES: Slowest memory performance of the bunch. Lacks FireWire support. And it's not an nForce2 board.

MAXIMUM PC VERDICT: 6
$120, www.soyousa.com

DARE TO COMPARE: MOTHERBOARDS

	Asus A7N8X Deluxe	MSI KT4 Ultra	Soyo KT-400 Dragon Ultra
SYSMark2002 Overall	**239**	220	216
SYSMark2002 Internet Content Creation	**295**	281	269
SYSMark2002 Office Productivity	**193**	173	174
3Dmark2001 Overall	**13,450**	13,210	12,495
Quake III "normal" audio disabled	**331.1**	306.1	277
SISoft Sandra 2002 RAM INT	**2599**	2510	2334
SISoft Sandra 2002 RAM Float	**2495**	2385	2165
SISoft Sandra 2003 RAM INT	**2600**	2492	2325
SISoft Sandra 2003 RAM Float	**2495**	2387	2164

Tests were conducted with an AMD Athlon 2800+ clocked at 2.25GHz, a pair of 256MB Corsair Micro DDR400 modules rated at DDR443 speeds, a Western Digital WD1200JB Mark I, an Asus V8460 Ultra GeForce4 Ti 4600 card, Detonator drivers, and a PC Power and Cooling Turbo Cool Silencer 400 power supply. The best scores are bolded.

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D-Link DCS-1000W Camera

Unlike most webcams, which must be permanently tethered to a PC, the DCS-1000W is a stand-alone unit that connects to the net using either its 10baseT port or a wireless Wi-Fi connection. Unfortunately, neither the web-based configuration nor the Windows configuration app is dummy-proof. Both require a decent understanding of TCP/IP networking vagaries.

The cam comes with everything you need to set it up as either a limited-access security camera or a webcam. Regardless, you'll need to assign an IP address and provide the cam with the settings for your wireless LAN before you can do anything else. Once you've got that up and running, you can configure multiple user accounts (which will let trusted parties access the live video stream) and set up an FTP process (which will let you use the camera as a simple, stand-alone webcam, sans the usual PC). You can choose among five image-quality compression settings and capture images at up to 640x480.

Unfortunately, the DCS-1000W's bundled networking accouterments catapult its price out of the "cool toy" category and into the business tool category. Even though it is indeed a very cool toy, at $330 it's just not cheap enough to buy unless you have a specific purpose in mind.

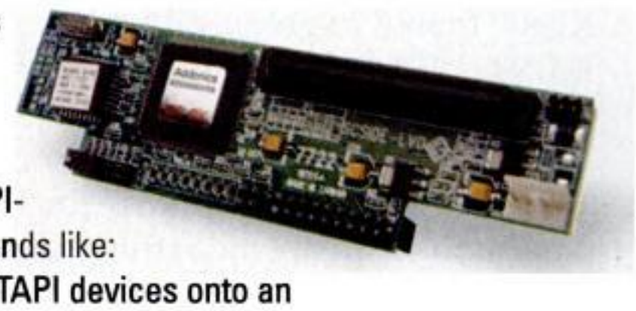
Regardless, if you've ever wanted to check in on your cats from work without having to set up another PC or run cumbersome Ethernet cables through your house, the DCS-1000W is exactly what you're looking for.

—WILL SMITH

MAXIMUM PC VERDICT: 8

$330, www.dlink.com

Addonics ATAPI-SCSI Converter



Here's a gizmo for all the SCSI freaks who've been sending Unabomber-style manifestos to Plextor ever since the company killed off its SCSI burner line. The Addonics ATAPI-SCSI Converter is exactly what it sounds like: an adapter that lets you snap most ATAPI devices onto an Ultra 160 SCSI connection without the need for drivers.

That's right, you can finally ditch your 12/10/32 Plextor burner for something sexier. We transparently burned CDs using both the Plextor 40/12/40A as well as a Lite-On 48x burner—both IDE drives. There's one important caveat, however: We achieved success only when the Converter was plugged into Addonics own U160 SCSI card, which uses an Achip controller chip. When we tried to write discs with our Lab-standard Adaptec 39160 SCSI controller, both *Nero* and *Easy CD Creator 5* crashed and burned (although we were able to extract digital audio without problems).

Is the problem with the Converter or the Adaptec card, or is it a general driver issue? We couldn't resolve the question, and Addonics even admitted that the Converter hadn't been tested with competitors' cards. This is a problem, because while the Converter is nifty, it isn't worth jack if it doesn't offer universal compatibility. It's a sad situation, because we can envision four or five of the converters running off one SCSI chain for bulk-copying chores.

If you're so averse to IDE that you're willing to shell out $100 for the controller and then possibly buy a new SCSI card too, the converter makes sense. But for the most part, its use is limited.

—GORDON MAH UNG

MAXIMUM PC VERDICT: 7

$109, www.addonics.com

Edirol DM-5 Studio Monitors

Once upon a time, speakers worthy of being called "studio monitors" were so expensive, only serious professional musicians could afford them. But luckily for computer geeks who record on their own PCs, studio-quality monitors are becoming cheaper every day.

Edirol's DM-5 monitors are unique for several reasons. First, they omit a subwoofer, forsaking the ultra-low bass frequencies that only a large speaker can provide for smoother crossover transitions and more precise mids and highs. Second, each monitor includes a digital decoder and inputs for either coax or Toslink optical SPDIF—all this in addition to switches that let you configure which channel each speaker will output to.

As is to be expected from studio monitors, the DM-5s sound great, and produce razor-sharp notes in the mid and high ranges. The crossover from the polypropylene driver to the soft dome tweeter is perfectly smooth. So smooth, in fact, we weren't able to detect it. We were disappointed with the low-frequency bass reproduction. The monitors' 5-inch drivers just don't have the juice to blast bass at frequencies below 120Hz. This is a plus in a studio environment, but a minus for gaming.

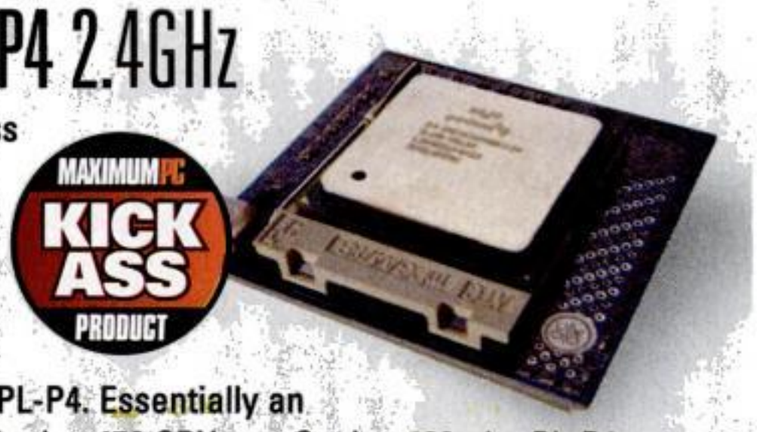
There are no front-mounted controls, which is a pain for day-to-day use as PC speakers. Still, these are studio monitors, so you're supposed to configure the volume and levels for each speaker, then handle volume and EQ functions using software. If you need a solid pair of studio speakers and don't want to shell out for the NHT reference speakers we reviewed in September 2002, the DM-5s are a great alternative. Just don't expect to use them for gaming.

—WILL SMITH

MAXIMUM PC VERDICT: 8

$350 per speaker, www.edirol.com

Powerleap PL-P4 2.4GHz



So you don't want to toss your aging Socket 423 Pentium 4 motherboard, but you want to run a CPU faster than 2GHz? Your only choice in town is PowerLeap's PL-P4. Essentially an adapter that marries a Socket 478 CPU to a Socket 423, the PL-P4 can effectively bump P4 "Willamettes" (1.3GHz to 2GHz) to current Northwood technology.

After updating the BIOS on an old Intel D850GB motherboard, we had our guinea pig system running at 2.4GHz. We're actually surprised the PL-P4 worked as well and as stable as it did, as we've had no success with other generic socket converters. Because the converter adds a little height to the CPU, you have to use a bundled heatsink instead of the stock one. Or, if you prefer, PowerLeap also includes stand-offs to let you adapt the heatsink you're already running.

To account for the voltage differences between the Northwood and Willamette cores, a small power line must also be hooked up to the converter. Since Socket 423 never left the 400MHz bus, the fastest your CPU will ever see without overclocking is 2.6GHz. Of course, not everyone will be able to use the PL-P4 due to motherboard and BIOS incompatibilities. We recommend that you visit PowerLeap's web site and check out the list of approved motherboards. All in all, the PL-P4 is a pleasant experience that'll give some people twice as much L2 cache as they had before, and up to 1.3GHz in faster clock cycles.

—GORDON MAH UNG

MAXIMUM PC VERDICT: 9

$300, www.powerleap.com

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Age of Mythology

The same team that brought you the history-inspired yet annoyingly 2D *Age of Empires* series has gone where it's never gone before—into a 3D engine. At first glance, *Age of Mythology* looks just like any other RTS from Ensemble, but unlike previous sprite-based games in the *Age* series, *AoM* features 3D units, 3D buildings, and 3D terrain. The practical upshot is that advanced RTS players can smoothly rotate and zoom the 3D camera at will, while retaining the newbie-friendly feel of the easily accessible *Age of Empires* series.

AoM has a more complex skill tree than most RTSes. There are three races— Norse, Greek, and Egyptian—each with three main deities. In the single-player game, your deity is chosen for you, but in multiplayer matchups, you make the selection. Additionally, each time your civilization advances, you must choose another sub-deity to worship. The deities that you choose to worship determine what special units you can create and what special god powers you can use. Ensemble took advantage of the god powers to really show off the new 3D interface. God powers range from the awesome terrain-warping meteor storm to a simple curse that turns all the enemy's soldiers into pigs.

Even with the new 3D engine and the godly skill tree, *Age of Mythology* plays the same as most RTS games: "Step 1: Collect resources. Step 2: Build a base. Step 3: Build an army. Step 4: Attack enemies." This might have been fun in 1997, but we're looking for more now.

—WILL SMITH

MAXIMUM PC VERDICT: 7

$50, www.ageofmythology.com

Need for Speed: Hot Pursuit 2

Imagine yourself racing along a tropical beach at 150mph with three police cars hot on your tail, a roadblock somewhere ahead, and five other Lamborghinis somewhere behind, waiting for you to take a turn a little too wide. *NFS:HP2* makes this movie chase scene a reality, although it falls just short of greatness due to a few frustrating design decisions.

There are 12 tracks, and you can set each one to run backwards and/or mirrored. They're all fairly long, varied, and well designed. You have several shortcuts on each track, which is nice for escaping the police and the many hurdles they put in your way. You'll see hidden caves, cobblestone streets, village roads, and abandoned bridges. Unfortunately, some paths are so narrow and primitive, you're better off on the main road.

All the cars (some of which aren't road-legal in the U.S. or only exist on paper) are a blast to drive. While flying along, you earn points to unlock cars and tracks. Just choose your vehicle wisely, because top speed isn't everything. In the early stages of Hot Pursuit mode, the police cars are just as good as yours, and extremely aggressive AI can make for frustrating, *Mad Max*–like road battles until you get a superior vehicle. In later stages, the police get gradually improved cars as well, although never quite as good as yours—if you choose wisely. That said, the cops' AI was strangely inconsistent, so we're withholding our highest honors.

—TOM MCNAMARA

MAXIMUM PC VERDICT: 8

$50, www.ea.com

Dragons Lair 3D

While other games were still pimping blocky sprites, Don Bluth brought his animation mastery to the arcades in 1983 and created a gorgeous, intensely addictive interactive animated movie called *Dragon's Lair*. In fact, the first-of-its-kind, laserdisc-based game probably enslaved more children than Kathie Lee Gifford. Now, 20 years later, we've got another opportunity to help screechy Dirk the Daring in his attempt to rescue Daphne from captivity in a booby-trapped castle crawling with freaks. *Dragon's Lair 3D* not only recreates the vibrant visuals of the original, but also throws in complete freedom of movement and new maneuvers like tucking-and-rolling and special attacks. Plus, you now pay just once to play the entire game.

It's too bad that the trial-and-error gameplay of the original is faithfully reproduced in this remake—this style of play has long been eclipsed by scads of innovative platform games and third-person action-adventure shooters. Even worse, the real evil you battle in *Dragon's Lair 3D* is the in-game camera, which sometimes inexplicably freezes in place and disables the mouse-look, leaving you to simply flail around and hope for the best during some jumping maneuvers—which you'll do over and over and over again. Although it's uninspired, *Dragon's Lair 3D* is still a colorful, entertaining recreation of the original that you can let your kids play without worrying about graphic violence or boobs.

—LOGAN DECKER

MAXIMUM PC VERDICT: 6

$30, www.ubi.com

RalliSport Challenge

It's games like this that just might break NASCAR's stranglehold on American racing. Featuring full-licensed, internationally famous rally cars from the likes of Suburu, Peugeot, and Lancia, this game lets you race not around ovals, or even curvy road courses, but through rugged terrain full of ice, gravel, mud, and sand. We won't go into the specifics behind the different Rally, Hill Climb, Ice Racing, and Rally Cross game modes, but we will tell you that the level design is fan-friggin-tastic, full of punishing obstacles, exhilarating jumps, blind turns, off-camber hairpins, narrowing roadways, and chasms just waiting to swallow you whole. The graphics engine features some stunning programmable shader tricks (check out the ice reflections in the snow courses), and every bit of roadway (if you can call it that) is beautifully detailed and rendered. We especially like the way the course designers mimicked real point-to-point rally racing by connecting dilapidated dirt paths with narrow, man-made bridges.

The book on this game is that its physics model is too forgiving. No amount of damage can shut down your vehicle, and the cars themselves are much easier to control than anything an actual sim would offer. That said, we thought the early stages were too easy to complete, while the later stages were too hard, unless you use real rally racing techniques, which are foreign to most gamers and difficult to master. Oh well, at least this game's got replay value!

—JON PHILLIPS

MAXIMUM PC VERDICT: 9

$45, www.microsoft.com/games

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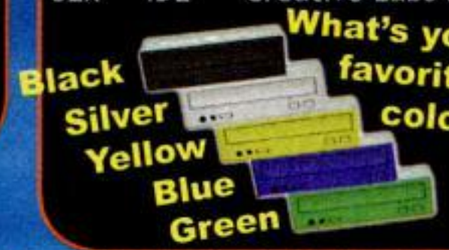

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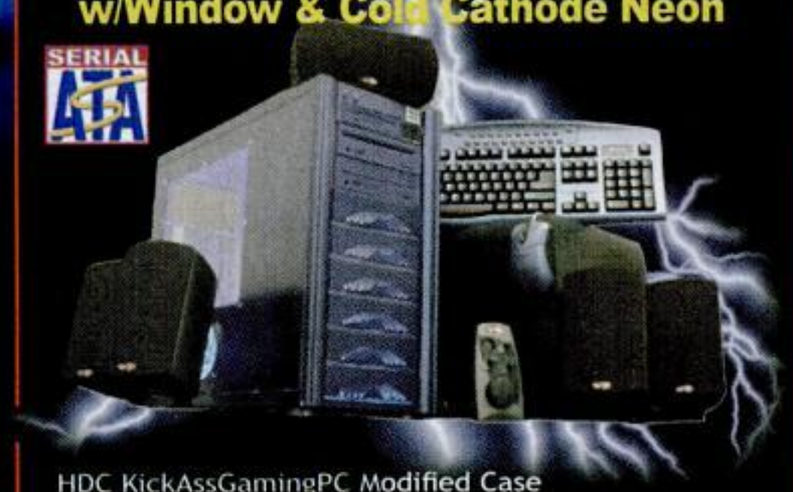

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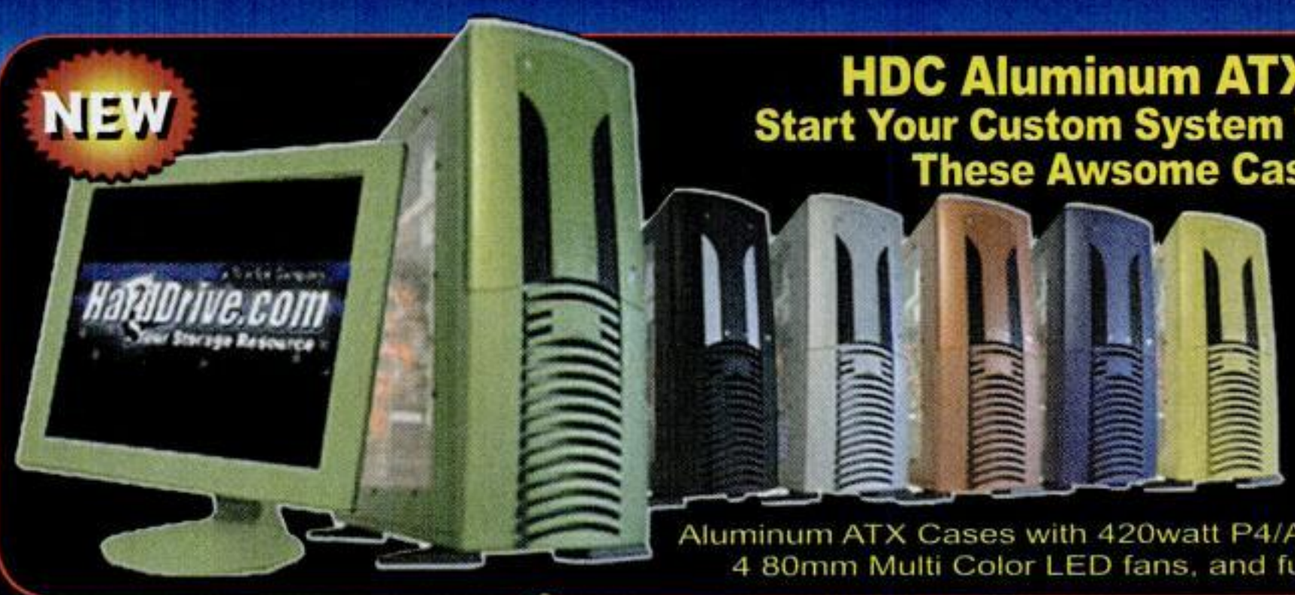

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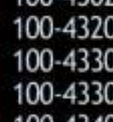

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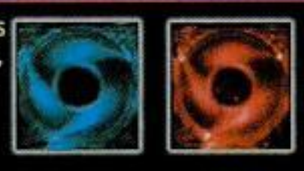

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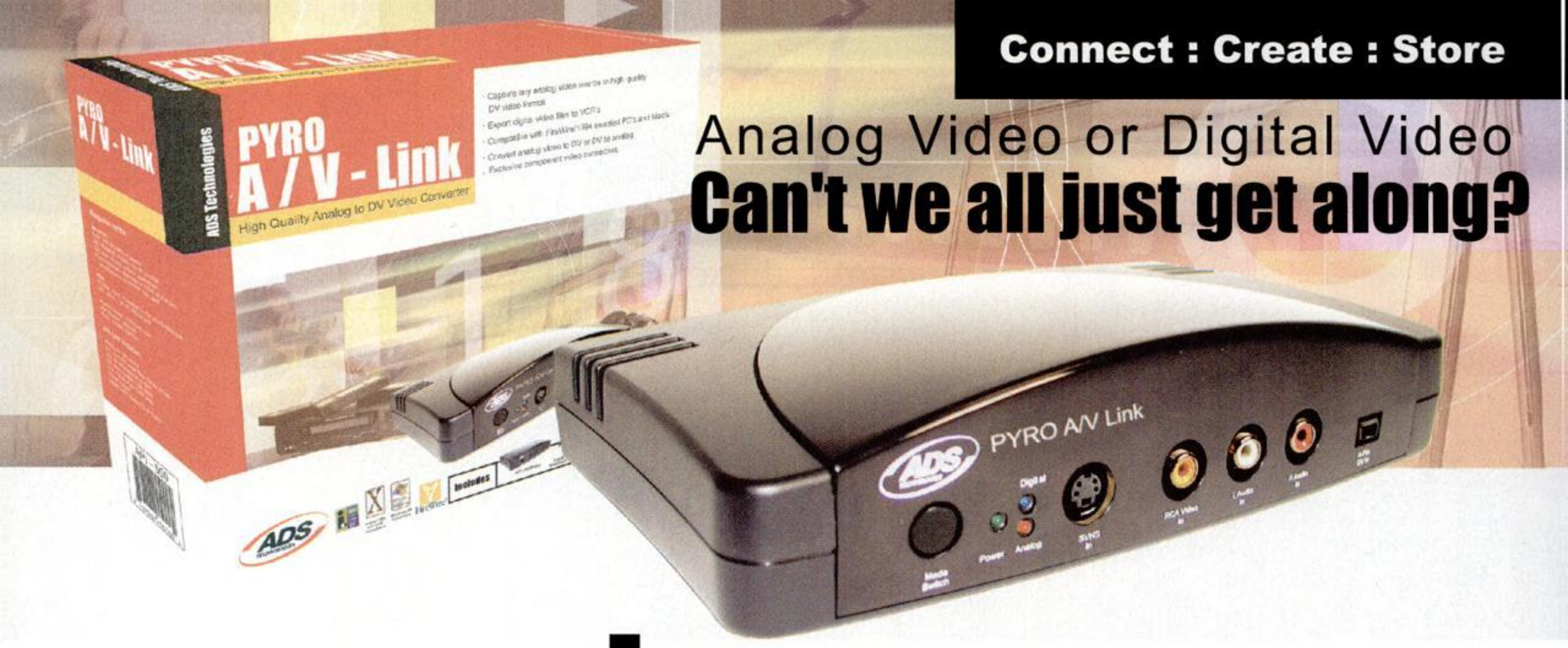

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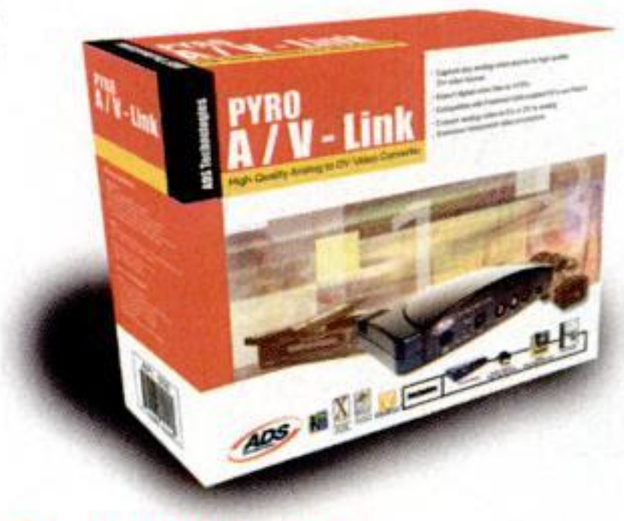

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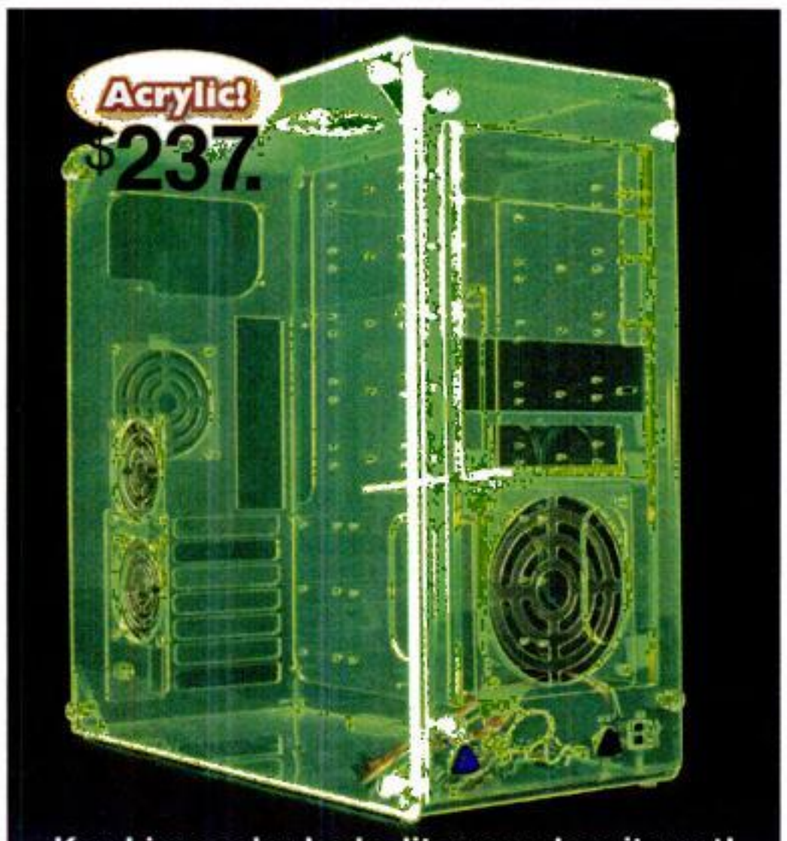

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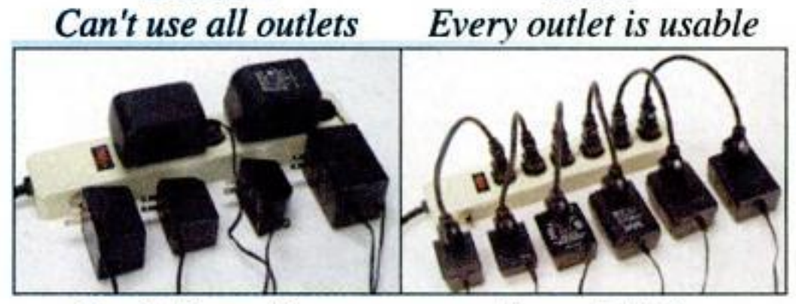

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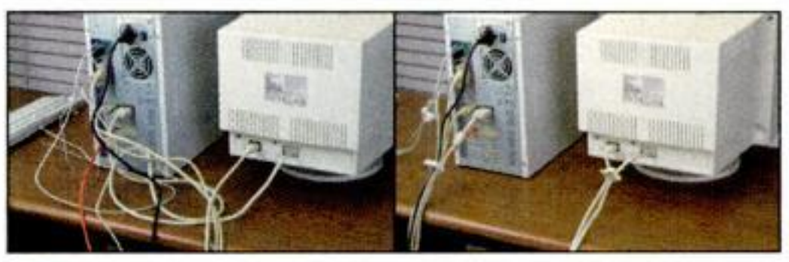

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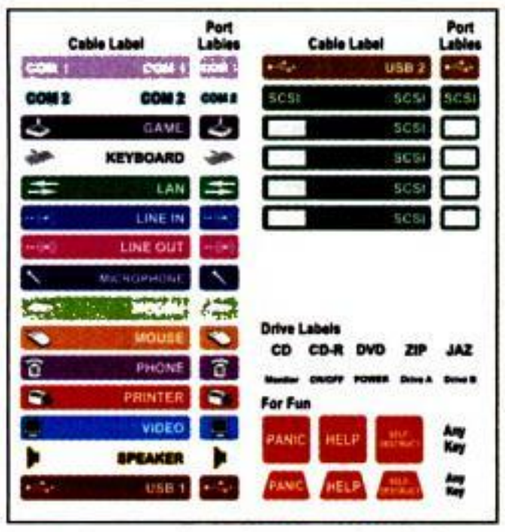

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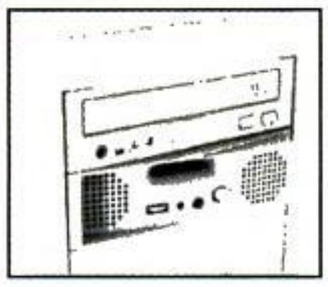

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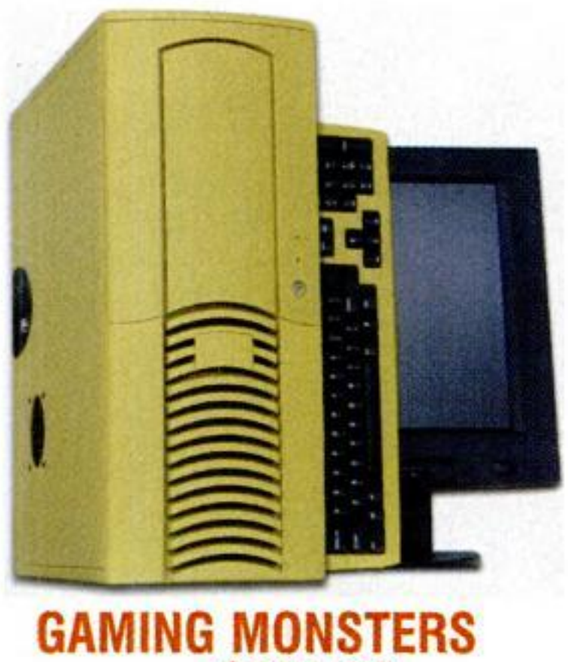

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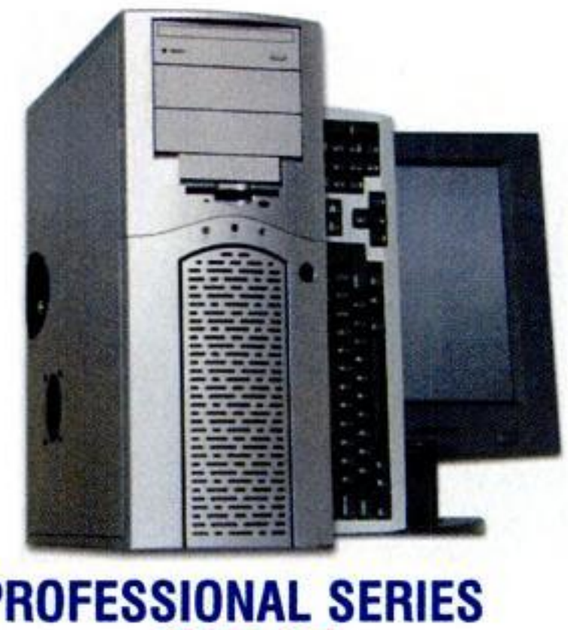

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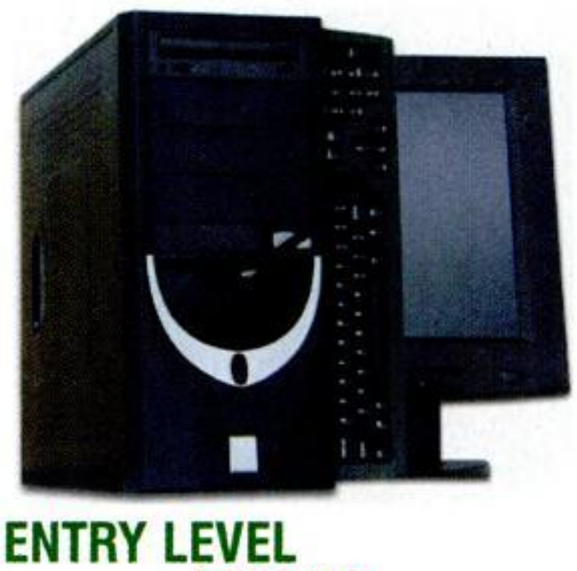

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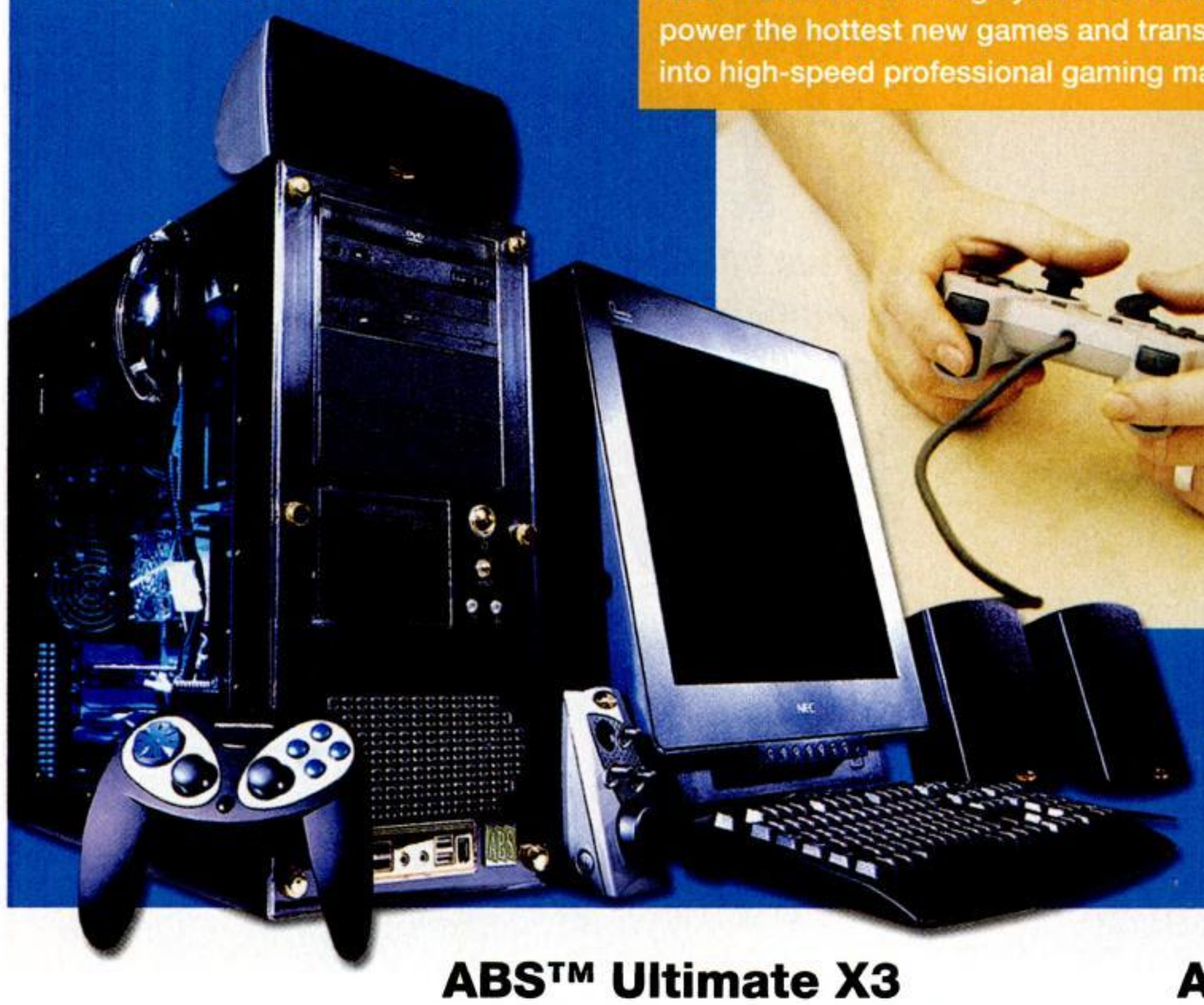

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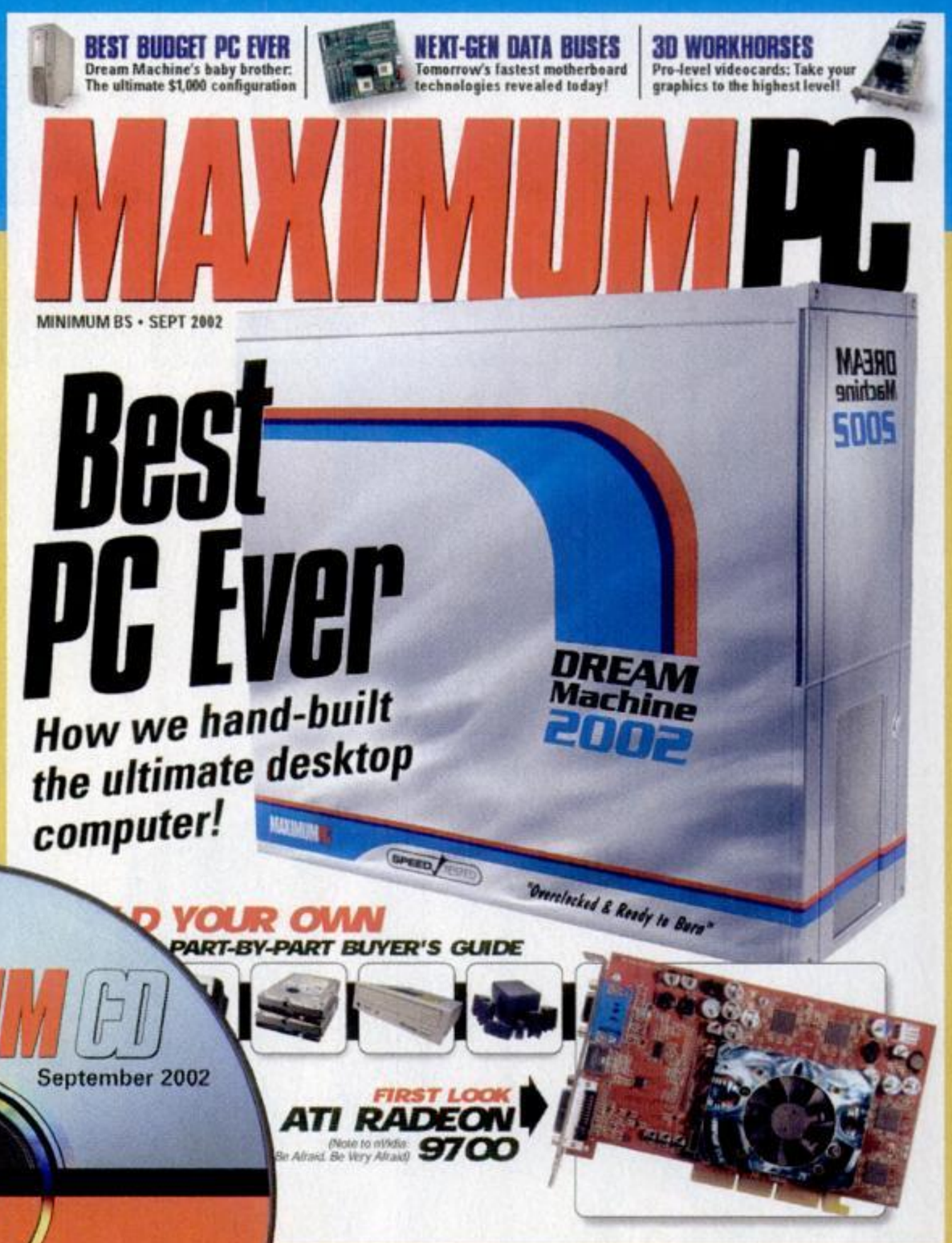

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MAXIMUM PC Rig of the Month

THIS MONTH: Mike Kohnke's "The Body Electric"

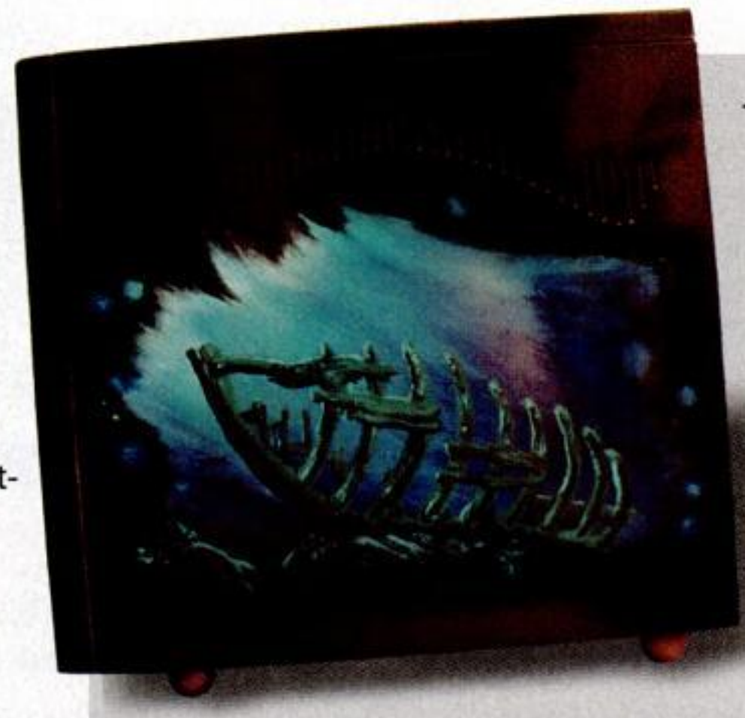
Let it never be said that *Maximum PC* ignores the interests of its Canadian readers. The beautiful rig you see here is Mike Kohnke's homage to the prog-rock power trio Rush—as Canadian as Mike Meyers, the Toronto Maple Leafs, and bacon. Everything about The Body Electric reflects Mike's passion for the band, and each panel sports art from a different decade of the band's history, all rendered in oil, airbrushing, and decals.

The centerpiece of the case is the fine Dremel work on the right-side window. The cutout of "The Man in the Star" from the 1976 concept album *2112* is stunning, especially when the interior is lit with dark-red cold-cathode tubes. Kohnke provides some Dremeling tips that should benefit all case modders...

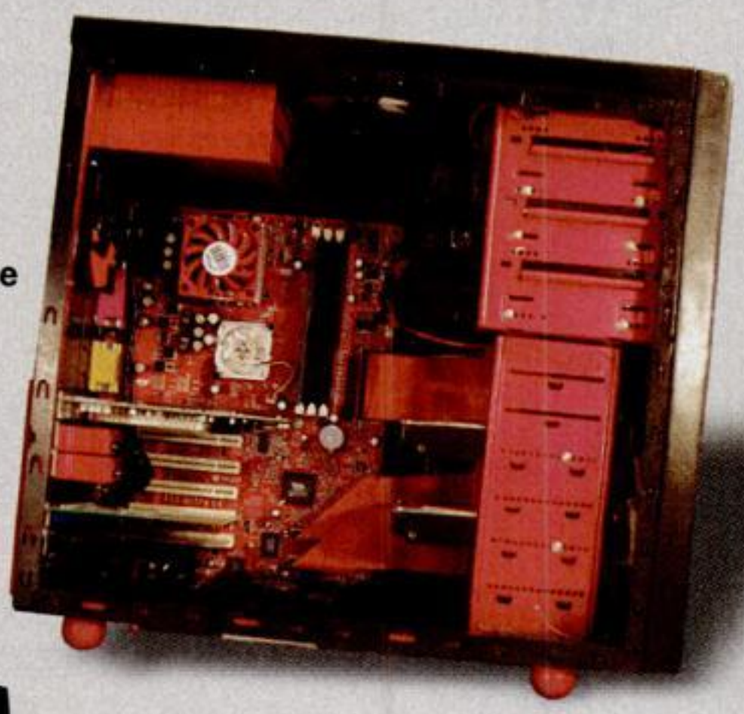
"For the window, things got tricky," he says. "I cut a hole in the center of the circle, and attached a flat piece of wood with a screw through it, so it can rotate, like the hands of a clock. I then mounted the Dremel tool to it with twist ties. I slowly rotated the tool around the circle to make the cut. It wasn't 100 percent perfect, but it was the best I could do.

"Next dilemma: How do I cut the star's perfectly straight lines with a Dremel tool? I clamped a piece of wood down just beyond the line that would be cut, so that the blade was directly over the cutting line. I just used the various shaping tools that came with the Dremel to cut the star man. The hardest parts were the hands. Those took about an hour each."

To do the front panel graphics, Mike used water slide decals. He ordered some blank decal sheets online and split the image of the juggler using Macromedia *Fireworks*. The decals were printed on a normal inkjet printer. "The decal process wound up taking about two weeks because several layers of clear coat must be sprayed onto the decal before it can be applied. Then I applied several more clear-coat treatments afterward to protect it."



◀The left side panel, featuring the skeleton of a sunken ship, is borrowed from the liner notes of 1997's *Test for Echo* CD. It's painted with oil over several layers of primer.



The Body ▶ Electric features interior lights to illuminate an Athlon 2000+. Plain cold-cathode lights weren't quite the right shade, so Mike wrapped them in red cello-wrap purchased at a party store.

◀The top of the case features a dragon based on the band's 2002 album *Vapor Trails*. The image only appeared in the album's tour book, so it's something that only a *true* Rush fan would recognize.

▲Kohnke created a homemade baybus to control both the red interior lights and four Vantec Stealth fans.

If you have a contender for Rig of the Month, e-mail **input@maximumpc.com** with pics and a brief write-up.

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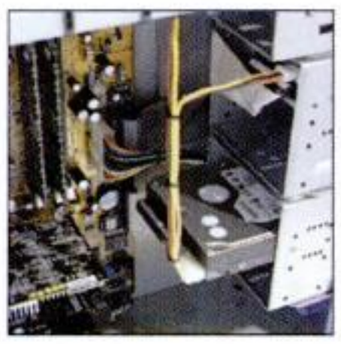

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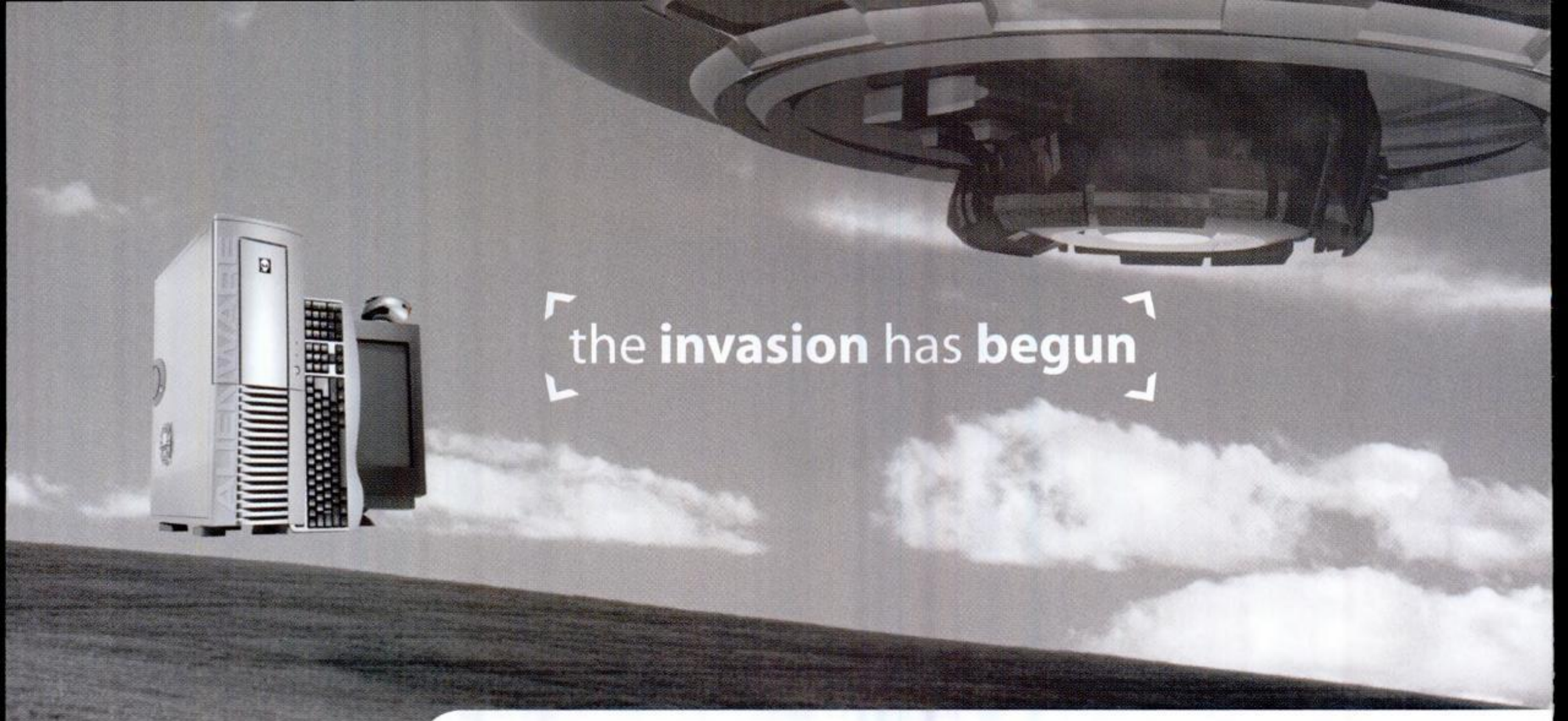

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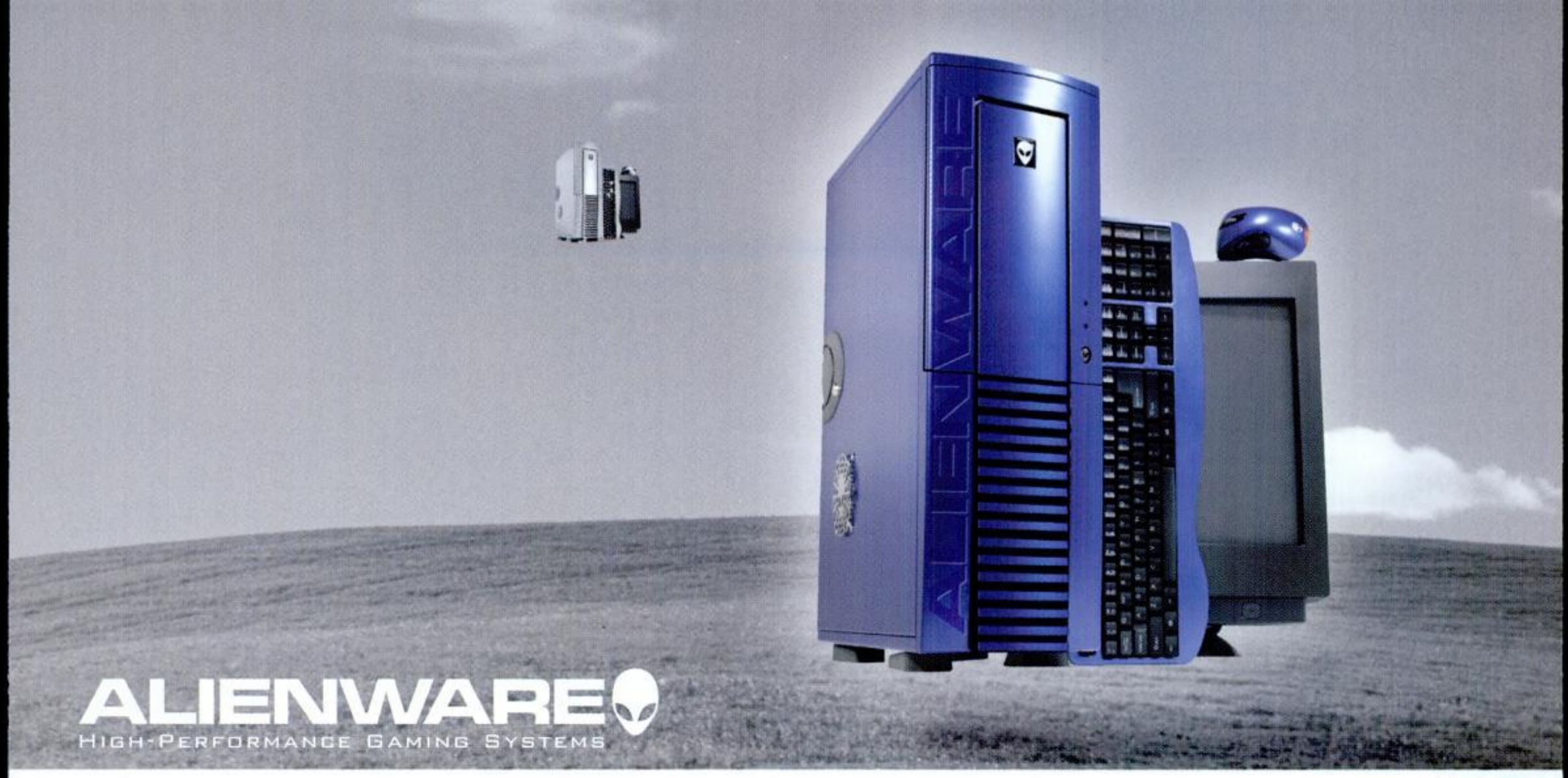

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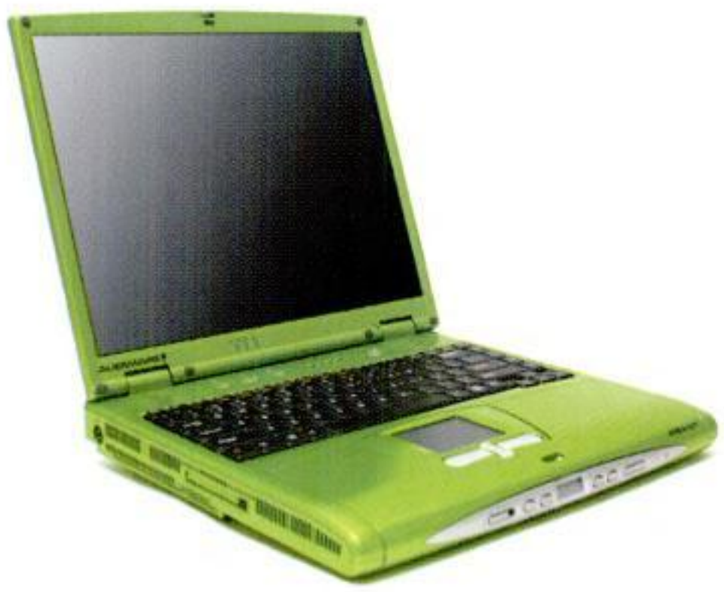

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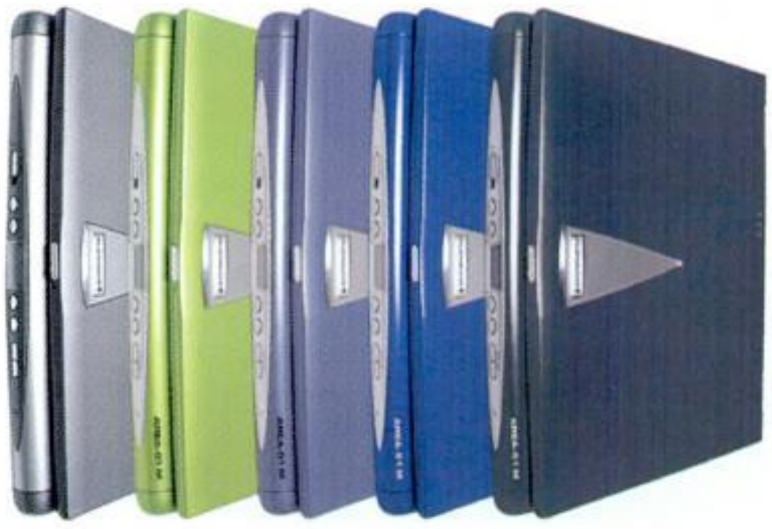
Intel® Pentium® 4 Processor at 3.06GHz
533 FSB and 512KB Advanced Transfer Cache
High-Performance Heatsink/Cooling with Arctic Silver III
Intel® 845MP+ ICH3M Chipset Motherboard
256MB PC-2100 DDR SDRAM
Exclusive Metallic Cyborg Green Chassis
40GB Ultra ATA100 Hard Drive
15.0" UltraXGA+ TFT Active Matrix LCD
ATI® Mobility RADEON™ 9000 PRO 64MB DDR
with Dual-View Display Monitor and TV-out
AlienAdrenaline: Video Performance Optimizer
Removable 3.5" Floppy Drive 1.44MB
Removable 24X/10X/24X CD-RW/8X DVD Combo Drive
Sound Blaster® PRO Compatible with Wavetable
5.1 3D Surround Sound with S/PDIF Digital Output
Front Panel Audio DJ CD Player
Allows CD Play While System is On or Off
One Type II PCMCIA Slot
Four USB 2.0 Ports and One IEEE 1394 Port
Infrared Wireless Fast IR Interface
10/100Mb Ethernet LAN and 56K Modem
Dimensions: (H) x (W) x (D) : 1.7" x 13" x 11.4"
Weight: 7.6lbs. without battery
Exclusive 120-Watt A/C Adapter
Microsoft® Windows® XP Home Edition
1-Year Toll-Free 24/7 Technical Support
AlienAutopsy: Automated Technical Support
Personalized Owner's Manual
FREE Exclusive Alienware® T-Shirt
FREE Custom Alienware® Mouse Pad
Optimized & Configured for High-Performance

$2,999.00

Desktops and Mobile Systems available in custom metallic colors!



PC GAMER EDITORS' CHOICE · MAXIMUM PC KICK ASS PRODUCT · Computer Games Editor's Choice · Computer Gaming World Editors' Choice · Computer Gaming World ★★★★★ · PC World Top 15 Home PCs · ZDNet Best Buy · Computer Shopper Choice · cnet Editors' Choice

Alienware® recommends Microsoft® Windows® XP Professional for Mobile Computing.

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ALIENWARE®

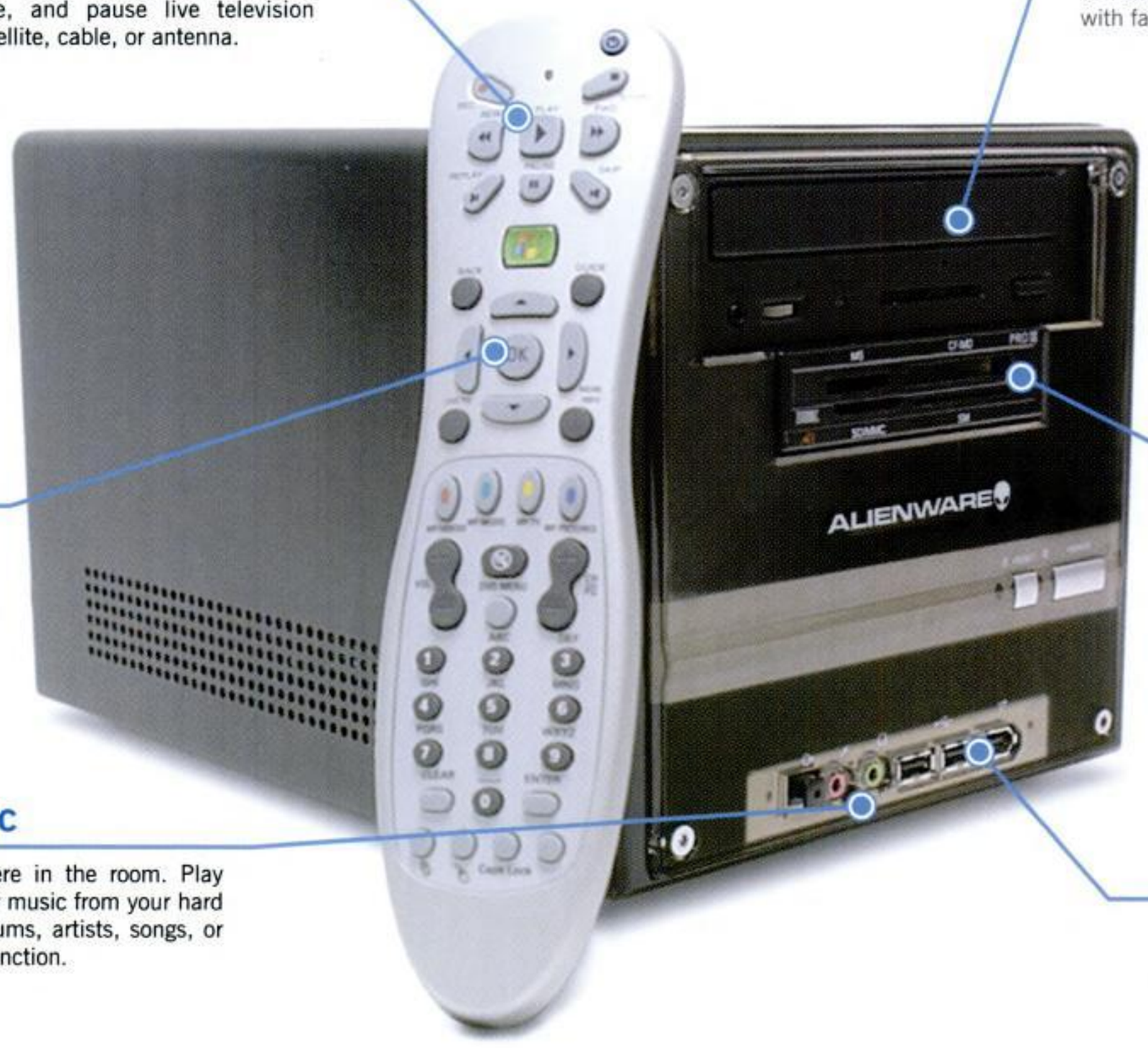
Introducing Navigator Powered By Microsoft® Windows® XP Media Center Edition

Control Live Television

Use Navigator to watch TV and you won't miss a second of your favorite programs. Navigator comes with a remote control that lets you record, rewind, frame advance, and pause live television regardless of what signal you have: satellite, cable, or antenna.

Burn Music, Photos, and Videos

Ensure that your favorite music, photos, TV episodes, and videos last forever by archiving them to CD or DVD. You can then create your own personal library, or share them with family and friends.



Enjoy DVDs

Navigator lets you watch DVDs from anywhere in the room, whether you're at your desk or on your living room couch. With advanced viewing features, you can sit back, relax, and enjoy a rich, full-screen experience in 5.1 surround sound.

View Your Favorite Photos

No matter what digital camera you have, Navigator will allow you to view digital photos one at a time or create an automated slide show. You can even personalize your photos by adding dates, titles, and background music.

Listen to Digital Music

Shuffle and play music from anywhere in the room. Play MP3s from the Internet, music CDs, or music from your hard drive. Quickly locate your favorite albums, artists, songs, or play lists with an easy-to-use search function.

Edit Digital Video

Import and edit digital video files to create your own movies. Keep them organized in a digital library for easy archive and retrieval.

Alienware® recommends Microsoft® Windows® XP.

NAVIGATOR MEDIACENTER

Intel® Pentium® 4 Processor at 2.53GHz
533FSB and 512KB Advanced Transfer Cache
High-Performance Heatsink/Cooling System
Intel® 845GE Chipset Motherboard
512MB PC-2700 DDR SDRAM
80GB 7200RPM Ultra ATA100 Hard Drive
NVIDIA® GeForce4™ Ti 4200 64MB DDR
5.1 Surround Sound with Optical Digital Output
PlexCombo 20X/10X/40X-12X CD-RW/DVD-ROM
Black Navigator Case with 200-Watt PS
Four USB 2.0 Ports and Three IEEE 1394 Ports
10/100 Integrated Ethernet Controller
Black Microsoft® Internet Keyboard
Black Microsoft® Intellimouse Explorer 3.0
Navigator Remote Control with Infrared Blaster
Navigator TV Tuner PCI Card
Navigator Universal Media Card Reader
Microsoft® Windows® XP Media Center Edition
1-Year Toll-Free 24/7 Technical Support
with Aliencare On-Site Home Service
Personalized Owner's Manual
FREE Exclusive Alienware® T-Shirt
FREE Custom Alienware® Mouse Pad
Optimized & Configured for High-Performance

$1,699.00

NAVIGATORPRO MEDIACENTER

Intel® Pentium® 4 Processor at 2.66GHz
533FSB and 512KB Advanced Transfer Cache
High-Performance Heatsink/Cooling System
Intel® 845GE Chipset Motherboard
512MB PC-2700 DDR SDRAM
120GB 7200RPM Ultra ATA100 Hard Drive
NVIDIA® GeForce4™ Ti 4200 64MB DDR
5.1 Surround Sound with Optical Digital Output
Pioneer® DVR-A05 DVD-R/RW Writer
Black Navigator Case with 200-Watt PS
Four USB 2.0 Ports and Three IEEE 1394 Ports
10/100 Integrated Ethernet Controller
Black Microsoft® Internet Keyboard
Black Microsoft® Intellimouse Explorer 3.0
Navigator Remote Control with Infrared Blaster
Navigator TV Tuner PCI Card
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Microsoft® Windows® XP Media Center Edition
1-Year Toll-Free 24/7 Technical Support
with Aliencare On-Site Home Service
Personalized Owner's Manual
FREE Exclusive Alienware® T-Shirt
FREE Custom Alienware® Mouse Pad
Optimized & Configured for High-Performance

$1,999.00

The Best of Computing and Home Entertainment

Introducing the Alienware® Navigator

Powered By Microsoft® Windows® XP Media Center Edition

NAVIGATOR

From the maker of the most powerful and innovative computing solutions available, comes the ultra-compact Navigator line. Smaller than traditional desktops, the Navigator and Navigator Pro models combine the advanced multi-media functionality of Microsoft® Windows® XP Media Center Edition with state-of-the-art performance, in a compact all-in-one solution.

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